

**CEMENT AND CONCRETE REFERENCE LABORATORY**  
**PROFICIENCY SAMPLE PROGRAM**

**Final Report**  
**Blended Cement Proficiency Samples**  
**Number 51 and Number 52**

May 2003



**CEMENT AND CONCRETE REFERENCE LABORATORY**

AT THE  
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY  
GAITHERSBURG, MARYLAND 20899  
(301) 975-6704

SPONSORED BY  
COMMITTEE C-1 ON CEMENT  
COMMITTEE C-9 ON CONCRETE AND  
CONCRETE AGGREGATES  
AMERICAN SOCIETY FOR TESTING AND MATERIALS

100 Bureau Dr., Stop 8618  
Fax: 301-975-2243  
e-mail: ccrl@nist.gov

May 9, 2003

**To: Participants in the CCRL Blended Cement Proficiency Sample Program**

**SUBJECT: Final Report on Blended Cement Proficiency Samples No. 51 and No. 52**

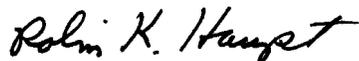
Enclosed is your copy of the final report, on the test results for the current pair of CCRL **Blended Cement** Proficiency Samples which were distributed in February 2003.

This report consists of a Table of Results for individual laboratory data, a statistical Summary of Results, a set of general Scatter Diagrams, and associated detailed information.

The CCRL Proficiency Sample Programs are intended for internal use by the laboratory as a tool to identify potential problems in laboratory procedures or test equipment and to initiate remedial actions. These programs are designed to complement the CCRL Laboratory Inspection Program as part of a total quality system. Care should be taken when using this program for any other use.

It is presently anticipated that the next Blended Cement Proficiency Samples will be distributed in February 2004.

Sincerely,



Robin K. Haupt  
Supervisor, Proficiency Sample Programs  
Cement and Concrete Reference Laboratory

Enclosure

**TO: Participants in the CCRL Blended Cement Proficiency Sample Program**

**FROM: Robin K. Haupt, Supervisor, PSP**

**SUBJECT: Explanation of Final Report on Results of Tests for Blended Cement Proficiency Samples No. 51 and No. 52**

This letter, and the material included with it, constitute the final report, and summary of results for the current pair of Blended Cement Proficiency Samples, which were distributed in February 2003. This material includes a Table of Results for individual laboratory data, a statistical Summary of Results, and a set of general Scatter Diagrams. Your unique laboratory number is displayed at the top of the individualized Table of Results.

An explanation of the program is contained in the paper: "Statistical Evaluation of Interlaboratory Cement Tests" by J. R. Crandall and R. L. Blaine, and "Statistical Aspects of the Cement Testing Program" by W.J. Youden, which can be found in Volume 59, Proceedings of the 62<sup>nd</sup> Annual Meeting of the Society, June 25, 1959, American Society for Testing and Materials.

Each laboratory receives an individualized Table of Results. The Table of Results shows the test title and the reporting unit in the first two columns. After that it lists in order, the laboratory's results for the odd and even numbered samples, overall averages for the odd and even numbered samples, and the laboratory's ratings for the odd and even samples. (See reverse for an explanation of the scatter diagrams.)

Laboratory ratings, shown in the Table of Results for the individual laboratory, were determined in the manner described by Crandall and Blaine using a rating scale of 1 to 5 instead of 0 to 4. The ratings have no valid standing beyond showing the difference between the individual laboratory result and the average for a particular test.

The following table details the relationship between the ratings and the averages.

<b>Ratings</b>	<b>Range (Number of Standard Deviations)</b>	<b>Number (Per 100) of Laboratories achieving the rating <sup>1</sup></b>
5	Less than 1	69
4	1 to 1.5	18
3	1.5 to 2	9
2	2 to 2.5	3
1	Greater than 2.5	1

The sign of the rating merely shows whether the result reported was greater or less than the average obtained.

Participants subscribing to the chemical analysis portion of this report should note that the statistics were calculated using data obtained by wet methods, and rapid methods of chemical analysis.

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<sup>1</sup>Youden, W.J., "Statistical Aspects of the Cement Testing Program", Volume 59, *Proceedings of the 62<sup>nd</sup> Annual Meeting of the Society, June 25, 1959, American Society for Testing and Materials.*

Please note that individual laboratory ratings were not given for the flow of air content mortar (test no. 190) and compressive strength mortar (test no. 230). Air content flows in the range of  $87.5 \pm 7.5$  are satisfactory. Similarly, the compressive strength flows in the range of  $110 \pm 5$  are satisfactory. Labs with flow values outside these ranges will be flagged as a "Labs Eliminated" on the scatter diagram. Averages, standard deviations, and a scatter diagram are provided for your information. This information may be a helpful indicator of a problem with flow table apparatus or mortar mixing procedures. Flow values of 151 were assigned to laboratories reporting a mortar flow off the flow table top.

In cases where some laboratories' results are eliminated, averages, standard deviations, coefficients of variation, and the ratings of the other laboratories' results, are recalculated using the data remaining after the elimination. Since the laboratory ratings given are the results from this one series of tests, you need not attach too much significance to a single low rating, or pair of ratings, from this one series. A continuing tendency to get low ratings on several pairs of samples should lead a laboratory to consider the types of error, systematic and random, contribute to ratings that are low. Systematic error, which is indicated by low ratings with the same signs on each pair of samples, means a consistent error is occurring in equipment and/or test procedures. One indication of random error is low ratings on both samples with different signs. The cause of systematic error is generally easier than random error to find since it occurs regularly.

### **Summary of Results - General**

Usually, averages, standard deviations, and coefficients of variation are given with all results reported, and then with one or more outlying results omitted. Sometimes, two or more recalculations with laboratories omitted, have been done for the same test. In these cases, all of the laboratories omitted in previous recalculations are also omitted in subsequent ones. Results omitted are values that are more than three standard deviations from the mean of one or both samples. Often, elimination of these outlying results has little effect on the average, but may have a more pronounced effect on the standard deviation and coefficient of variation.

### **Scatter Diagrams**

General scatter diagrams are supplied with this report. Crandall and Blaine describe the manner of preparing scatter diagrams, and their interpretation, in the paper published in the 1959 ASTM Proceedings. Each laboratory will receive a complete set of diagrams according to their subscription to the given program.

Using the results received from each laboratory, a scatter diagram is generated for each test method by plotting the value for the odd numbered samples on the *X*, or horizontal axis, against the value for the even numbered samples on the *Y*, or vertical axis. To find your point, just plot as you would when plotting any scatter diagram. Vertical and horizontal dashed lines, which divide the diagrams into four sections or quadrants, place the average values for the odd and even numbered samples, respectively. The first line of print under the diagram includes the test number, as given on the data sheet, the test title, and the number of data points on the diagrams. The number of plotted points may not agree with the total number of data pairs included in the analysis because a few points may be off the diagram, and some points may represent several data pairs, which are identical. Laboratories whose points are off the diagram will have a rating of  $\pm 1$  for that particular test.

As described in Crandall and Blaine, a tight circular pattern of points around the intersection of the median lines is the ideal situation. Stretching out of the pattern into the first (upper right) and third (lower left) quadrants, suggests some kind of bias, or tendency for laboratories to get high or low results on both samples. Examination of the scatter diagrams indicates strong evidence of bias on many tests.

CCRL PROFICIENCY SAMPLE PROGRAM  
Blended Cement Proficiency Samples No. 51 and No. 52  
Final Report - May 9, 2003  
Chemical Results

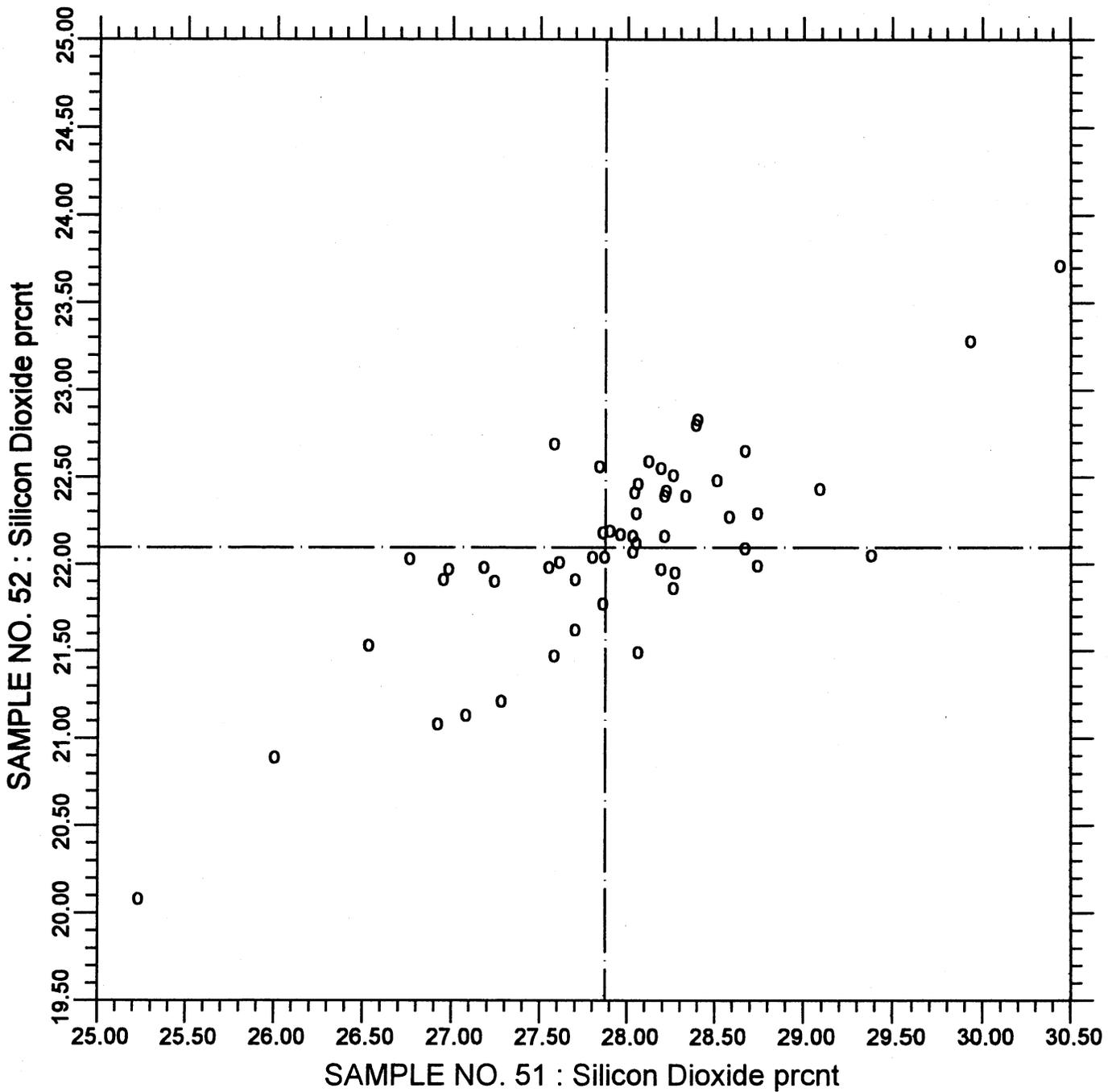
SUMMARY OF RESULTS

		Sample No. 51				Sample No. 52		
Test		#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Silicon Dioxide	prcnt	56	27.63	1.6	5.95	21.98	1.1	4.97
Silicon Dioxide	prcnt	* 54	27.88	0.99	3.54	22.10	0.57	2.60
Aluminum Oxide	prcnt	49	6.18	0.27	4.38	5.92	0.25	4.30
Aluminum Oxide	prcnt	* 47	6.18	0.22	3.62	5.92	0.19	3.22
Ferric Oxide	prcnt	54	3.02	0.27	8.82	3.09	0.25	7.99
Ferric Oxide	prcnt	* 53	3.05	0.20	6.41	3.11	0.16	5.12
Calcium Oxide	prcnt	54	52.40	1.5	2.91	60.67	1.1	1.81
Calcium Oxide	prcnt	* 52	52.31	1.38	2.63	60.79	0.81	1.34
Magnesium Oxide	prcnt	56	2.84	0.19	6.78	2.62	0.20	7.57
Magnesium Oxide	prcnt	* 52	2.81	0.15	5.26	2.59	0.12	4.63
Sulfur Trioxide	prcnt	57	2.61	0.19	7.35	2.64	0.14	5.11
Sulfur Trioxide	prcnt	* 53	2.61	0.110	4.21	2.63	0.084	3.20
Loss on Ignition	prcnt	57	3.67	0.280	7.63	1.49	0.08	5.09
Loss on Ignition	prcnt	* 55	3.71	0.079	2.14	1.49	0.062	4.18
Phosphorus Pent	prcnt	39	0.111	0.022	19.5	0.158	0.043	27.4
Phosphorus Pent	prcnt	* 37	0.109	0.015	13.6	0.151	0.017	11.4
Titanium Dioxide	prcnt	40	0.314	0.035	11.2	0.387	0.054	14.0
Titanium Dioxide	prcnt	* 37	0.316	0.029	9.33	0.389	0.023	5.93

\* ELIMINATED LABS: Data over three S.D. from the mean

Silicon Dioxide	3 11
Aluminum Oxide	14 47
Ferric Oxide	3
Calcium Oxide	24 30
Magnesium Oxide	3 18 35 1715
Sulfur Trioxide	38 92 159 309
Loss on Ignition	169 1251
Phosphorus Pentoxide	176 1251
Titanium Dioxide	18 46 176

CCRL PROFICIENCY SAMPLE PROGRAM  
 Silicon Dioxide  
 BLENDED CEMENT SAMPLE NOS. 51 & 52



**TEST NO.10**

**Silicon Dioxide**

**53 POINTS**

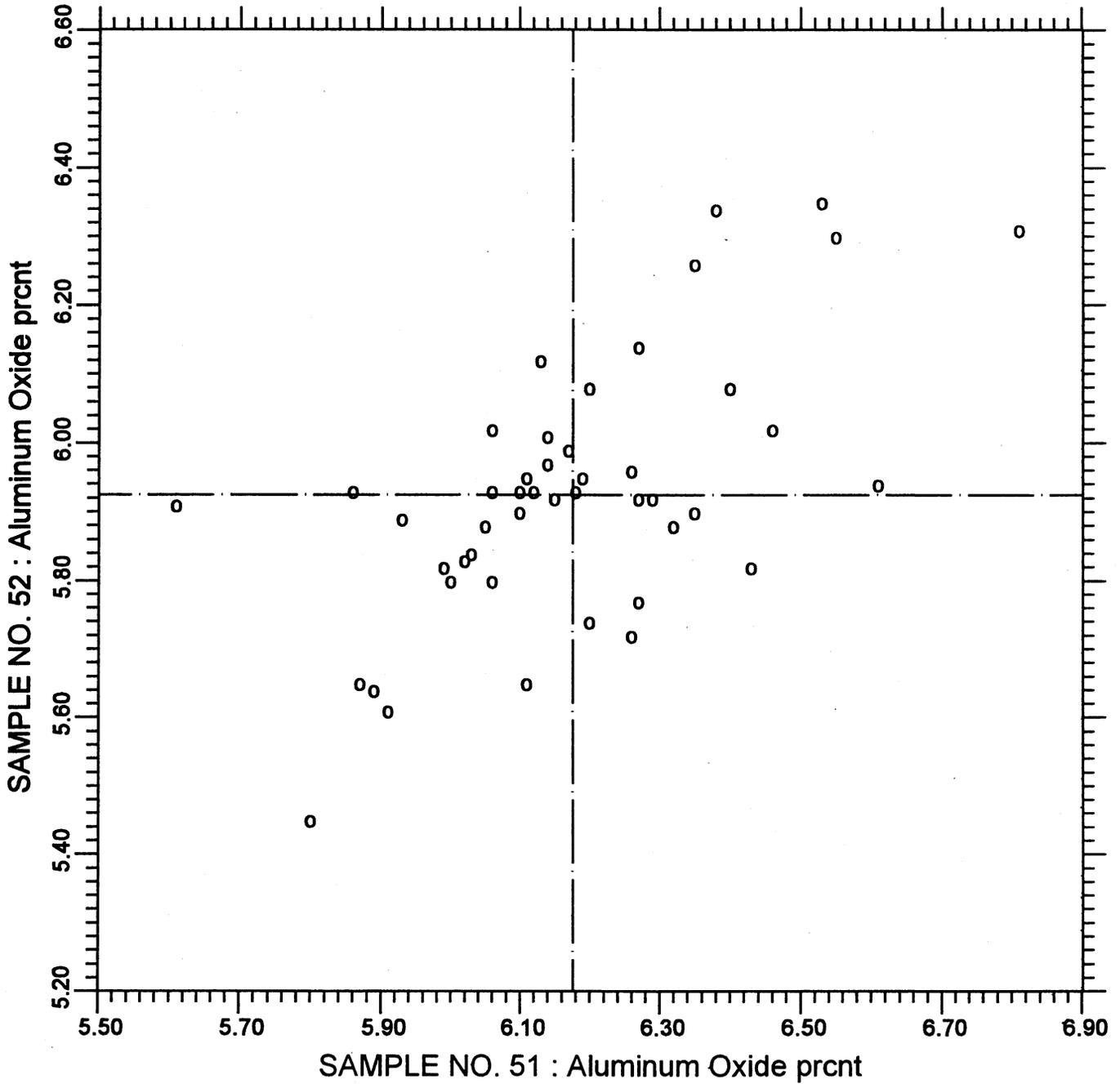
SAMPLE NO. 51 AVE 27.876 S.D. 0.99 C.V. 3.54

SAMPLE NO. 52 AVE 22.098 S.D. 0.57 C.V. 2.60

LABS ELIMINATED 3 11

LABS OFF DIAGRAM 24

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Aluminum Oxide - wo/minor oxides**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.21**

**Aluminum Oxide**

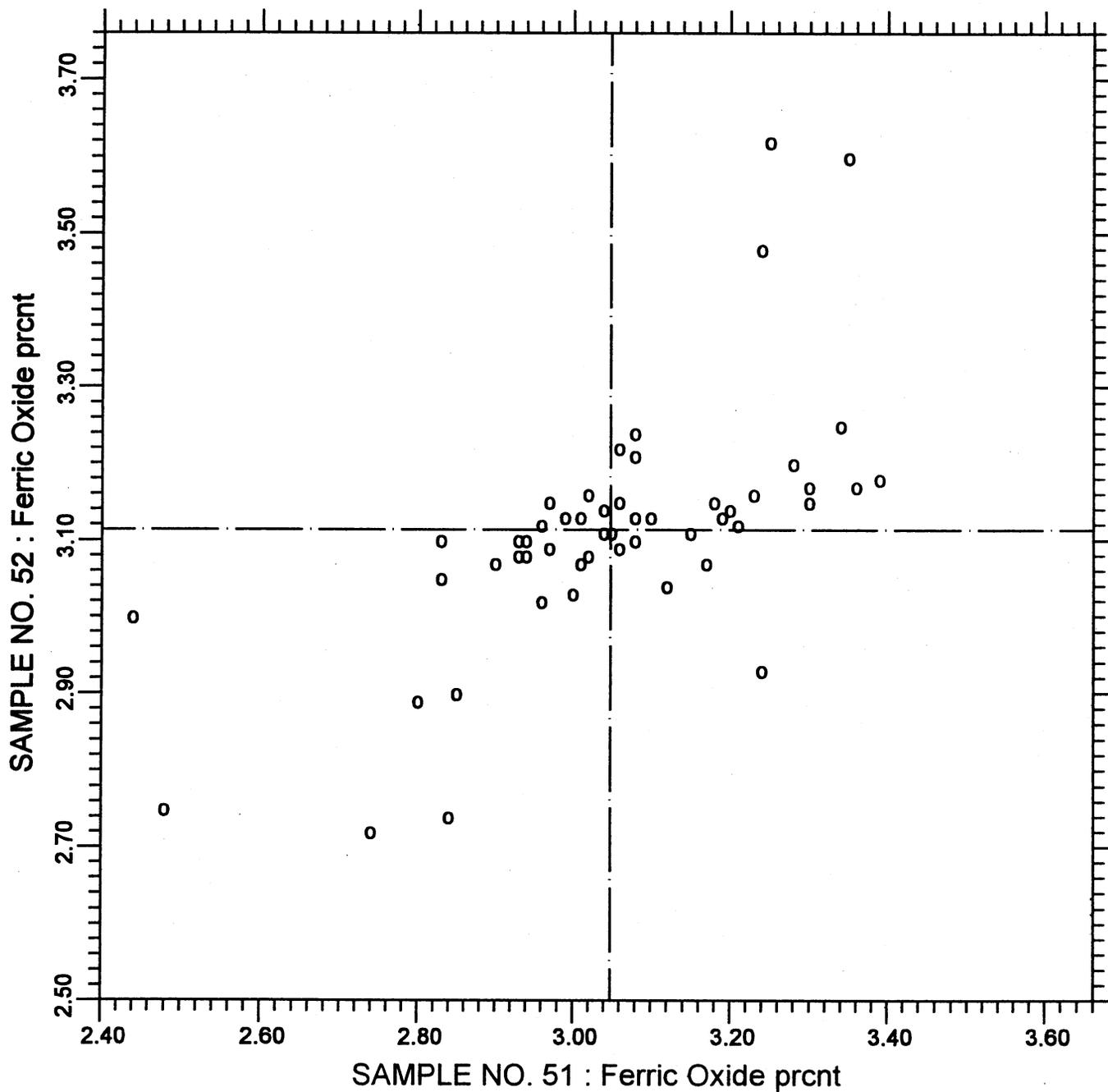
**47 POINTS**

SAMPLE NO. 51 AVE 6.176 S.D. 0.22 C.V. 3.62

SAMPLE NO. 52 AVE 5.925 S.D. 0.19 C.V. 3.22

LABS ELIMINATED 14 47

CCRL PROFICIENCY SAMPLE PROGRAM  
 Ferric Oxide  
 BLENDED CEMENT SAMPLE NOS. 51 & 52



TEST NO.30

Ferric Oxide

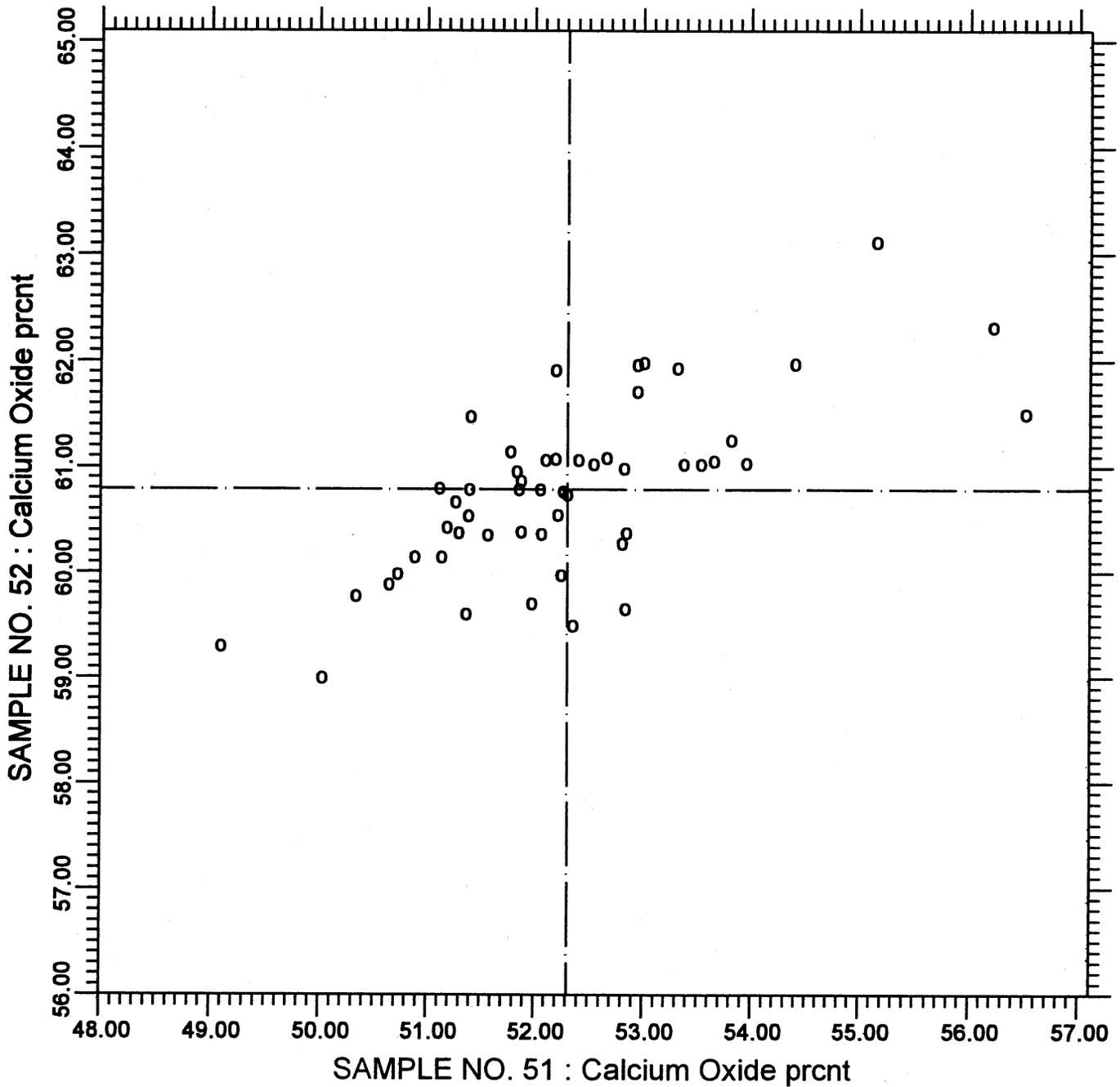
53 POINTS

SAMPLE NO. 51 AVE 3.048 S.D. 0.20 C.V. 6.41

SAMPLE NO. 52 AVE 3.113 S.D. 0.16 C.V. 5.12

LABS ELIMINATED 3

CCRL PROFICIENCY SAMPLE PROGRAM  
 Calcium Oxide  
 BLENDED CEMENT SAMPLE NOS. 51 & 52



TEST NO.40

Calcium Oxide

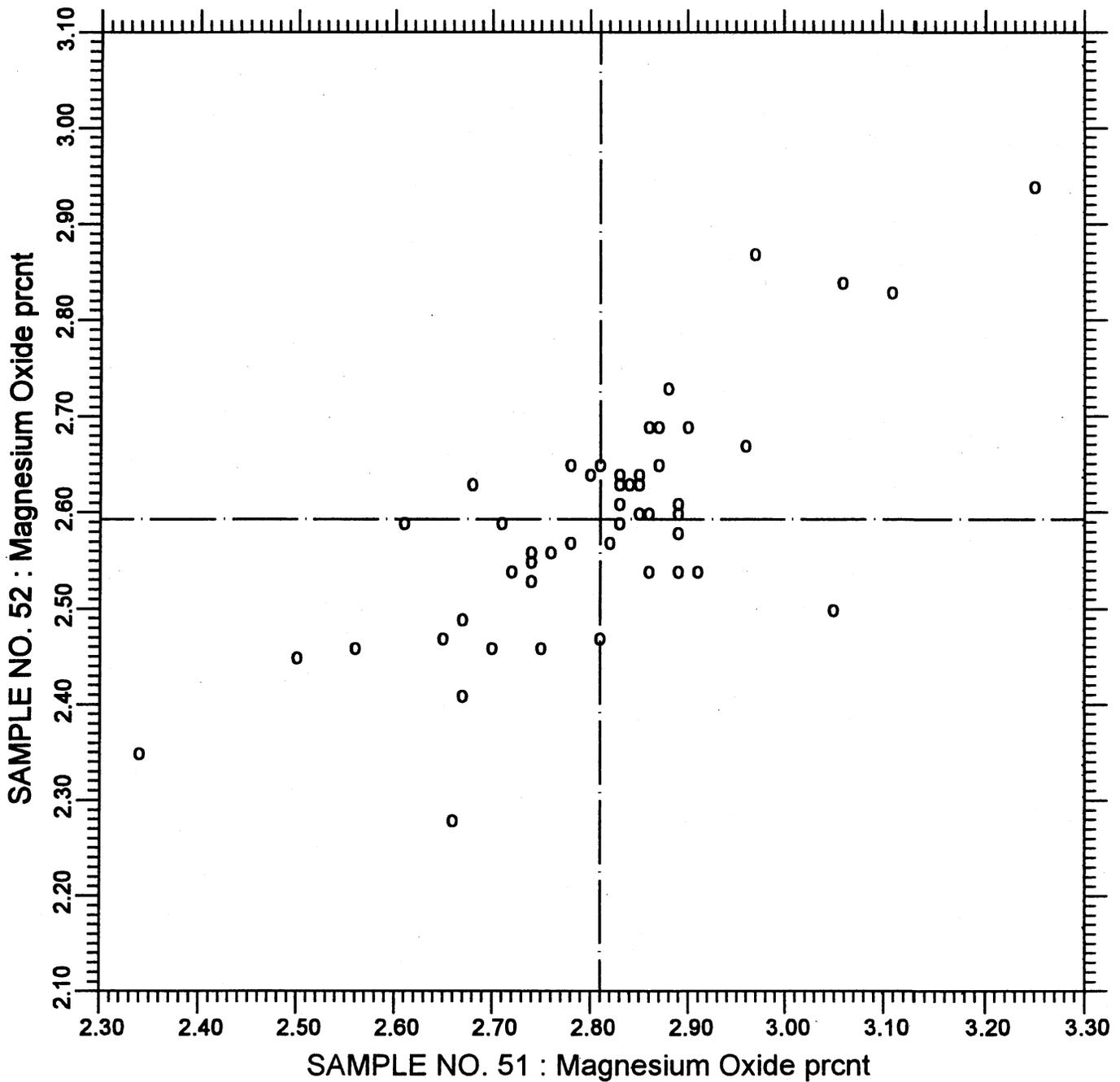
52 POINTS

SAMPLE NO. 51 AVE 52.31 S.D. 1.38 C.V. 2.63

SAMPLE NO. 52 AVE 60.79 S.D. 0.81 C.V. 1.34

LABS ELIMINATED 24 30

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Magnesium Oxide**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.50**

**Magnesium Oxide**

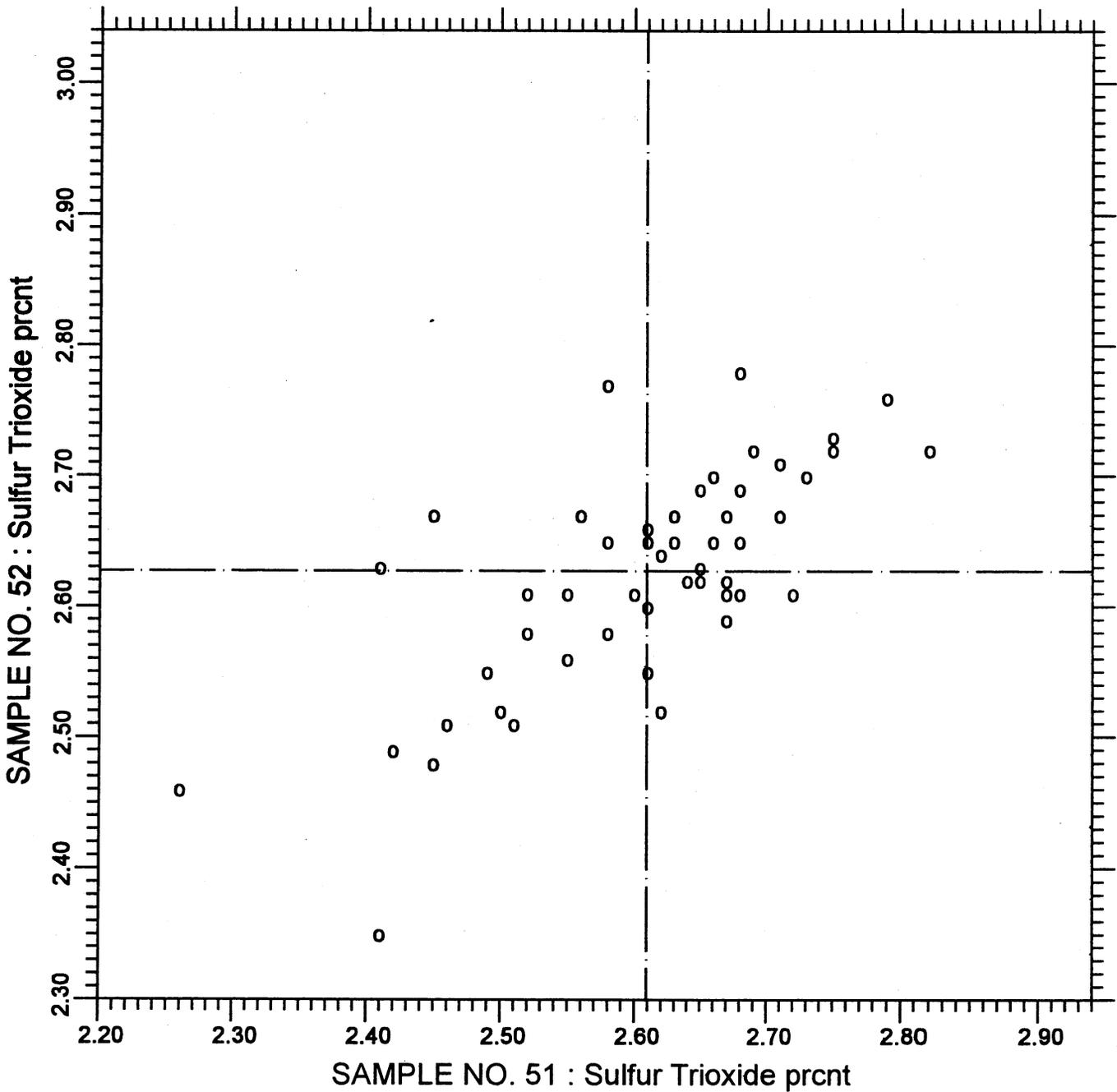
**52 POINTS**

SAMPLE NO. 51    AVE 2.810    S.D. 0.15    C.V. 5.26

SAMPLE NO. 52    AVE 2.593    S.D. 0.12    C.V. 4.63

LABS ELIMINATED 3 18 35 1715

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Sulfur Trioxide**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.60**

**Sulfur Trioxide**

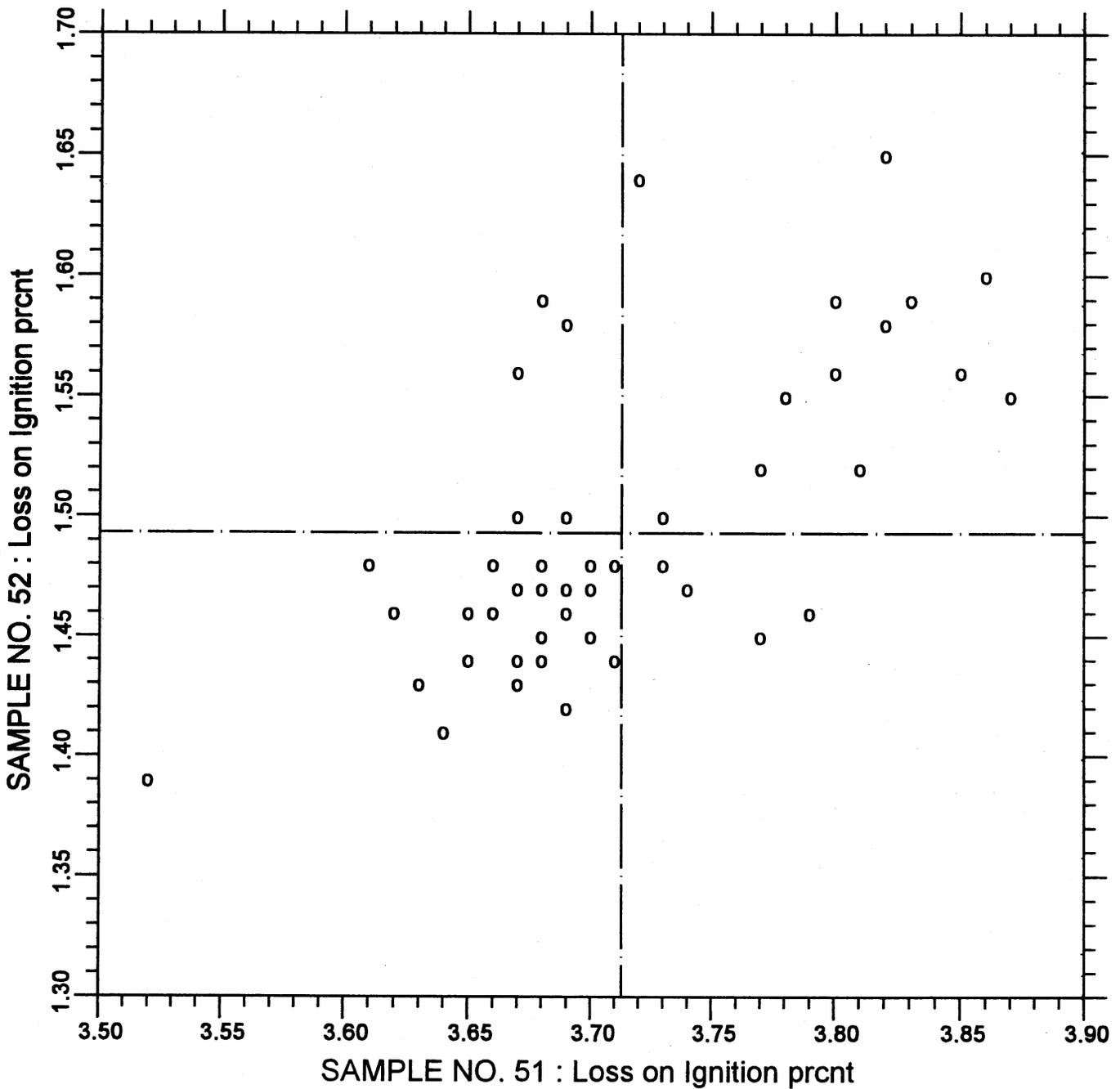
**53 POINTS**

SAMPLE NO. 51 AVE 2.609 S.D. 0.110 C.V. 4.21

SAMPLE NO. 52 AVE 2.627 S.D. 0.084 C.V. 3.20

LABS ELIMINATED 38 92 159 309

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Loss on Ignition**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.70**

**Loss on Ignition**

**54 POINTS**

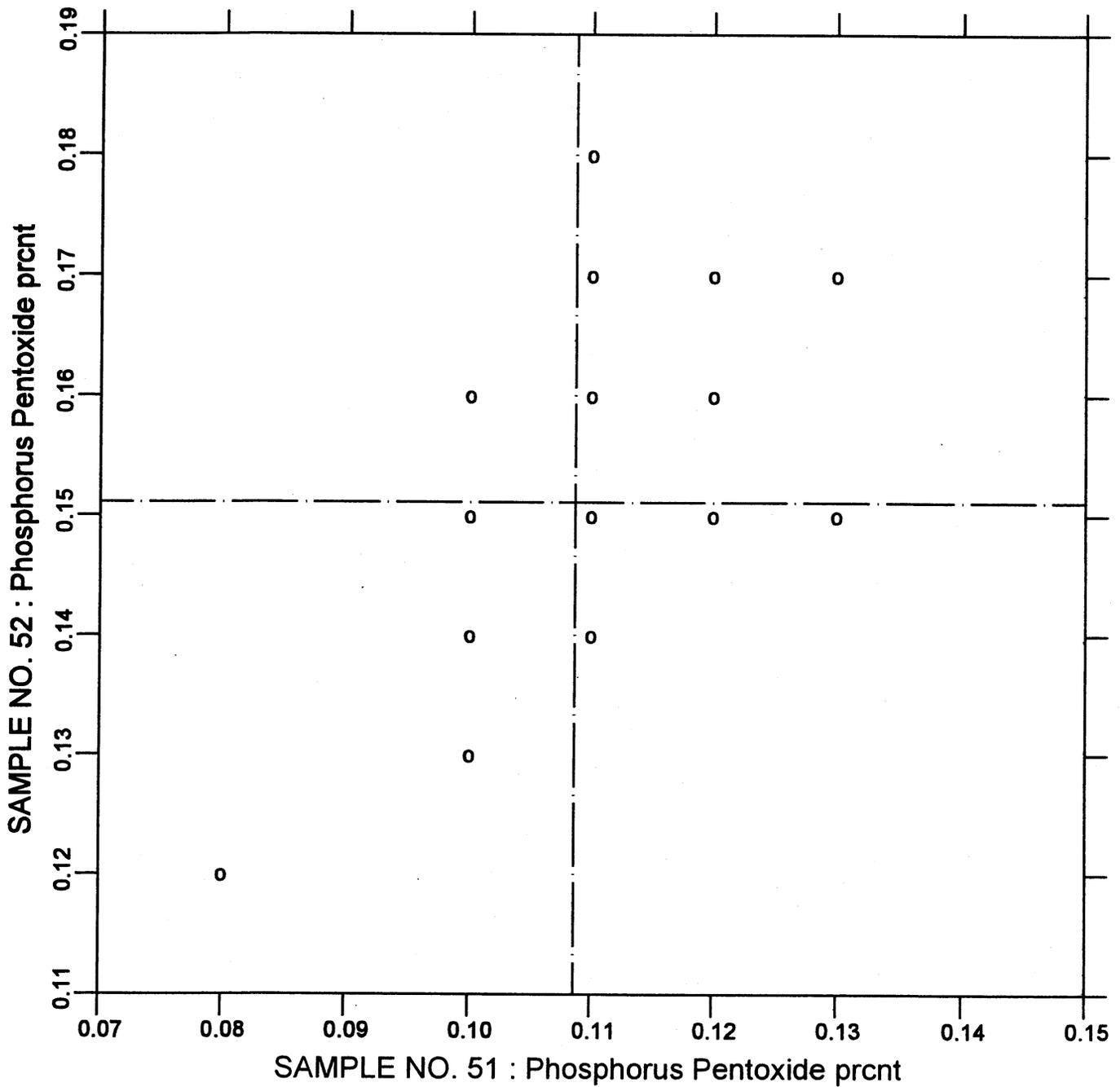
SAMPLE NO. 51 AVE 3.7129 S.D. 0.079 C.V. 2.14

SAMPLE NO. 52 AVE 1.4931 S.D. 0.062 C.V. 4.18

LABS ELIMINATED 169 1251

LABS OFF DIAGRAM 3

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Phosphorus Pentoxide**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.102**

**Phosphorus Pentoxide**

**35 POINTS**

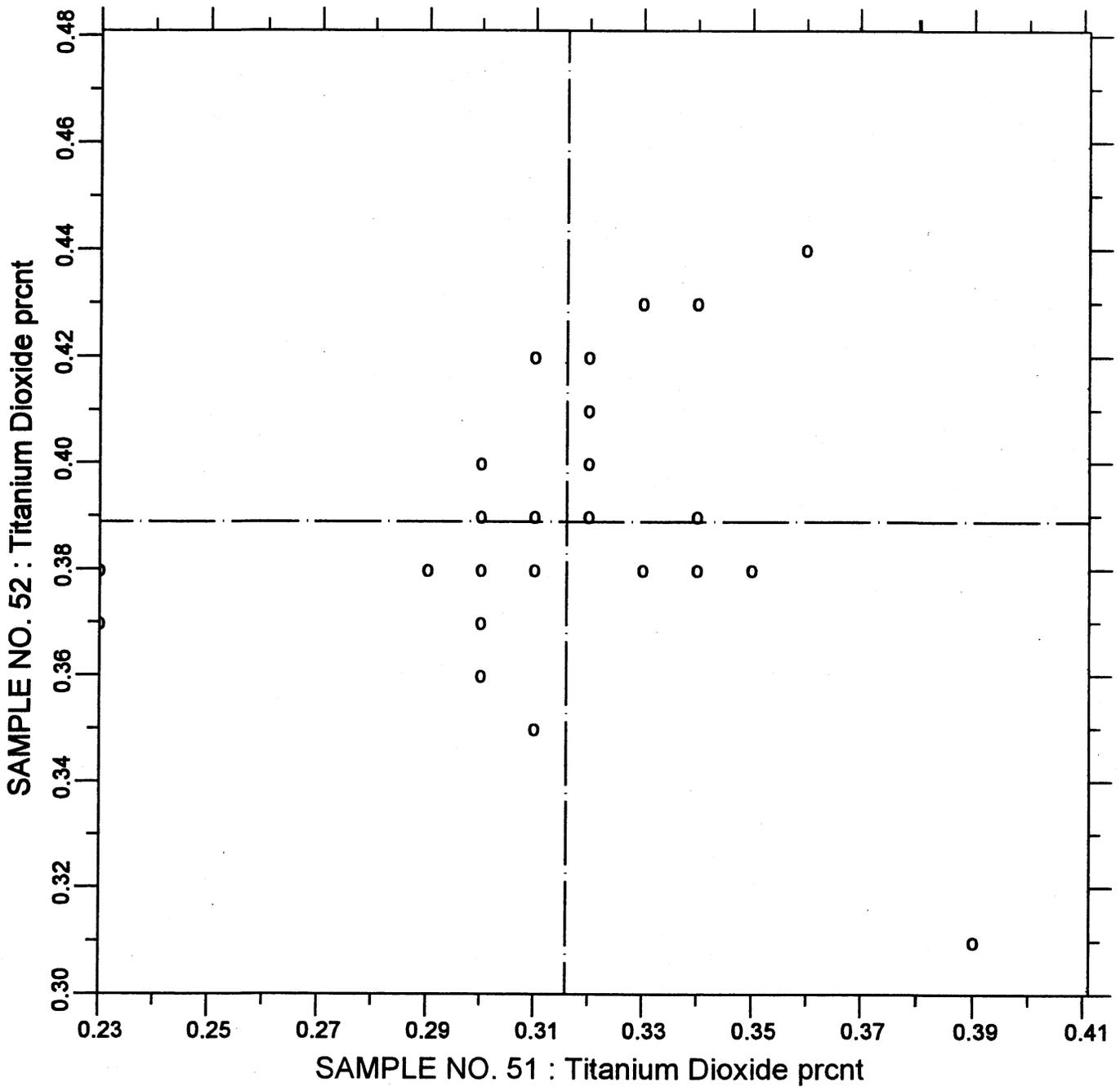
SAMPLE NO. 51 AVE 0.1086 S.D. 0.015 C.V. 13.6

SAMPLE NO. 52 AVE 0.1511 S.D. 0.017 C.V. 11.4

LABS ELIMINATED 176 1251

LABS OFF DIAGRAM 47 246

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Titanium Dioxide**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.103**

**Titanium Dioxide**

**37 POINTS**

SAMPLE NO. 51 AVE 0.3159 S.D. 0.029 C.V. 9.33

SAMPLE NO. 52 AVE 0.3889 S.D. 0.023 C.V. 5.93

LABS ELIMINATED 18 46 176

CCRL PROFICIENCY SAMPLE PROGRAM  
 Blended Cement Proficiency Samples No. 51 and No. 52  
 Final Report - May 9, 2003  
 Physical Results

SUMMARY OF RESULTS

			Sample No. 51			Sample No. 52		
Test		#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
N.C. Water	prent	63	26.2	0.52	1.99	25.6	0.50	1.94
N.C. Water	prent	* 61	26.1	0.48	1.82	25.6	0.38	1.50
Vicat TS Initial	min	61	156	25.4	16.3	151	24.4	16.2
Vicat TS Initial	min	* 59	154	21.8	14.2	148	18.5	12.5
Vicat TS Final	min	59	267	47.3	17.7	257	45.9	17.9
Vicat TS Final	min	* 58	272	35.7	13.1	260	38.1	14.6
Autoclave Expan	prent	60	0.069	0.054	77.9	0.037	0.037	101.4
Autoclave Expan	prent	* 55	0.072	0.025	34.5	0.038	0.018	47.5
Air Content	prent	56	4.8	1.5	31.3	5.7	1.3	22.3
Air Content	prent	* 54	4.8	1.0	22.0	5.6	1.1	20.2
AC Mix Water	prent	56	68.6	2.4	3.58	68.9	2.3	3.34
AC Mix Water	prent	* 55	68.8	2.2	3.16	69.0	2.1	3.08
AC Flow	prent	56	88	3.6	4.07	88	3.4	3.88
Specific Gravity		51	2.94	0.048	1.65	3.10	0.056	1.82
Specific Gravity		* 49	2.94	0.038	1.30	3.10	0.048	1.54

CONTINUED ON REVERSE SIDE

\* ELIMINATED LABS: Data over three S.D. from the mean

N.C. Water	34 975
Vicat TS Intial	33 975
Vicat TS Final	51
Autoclave Expansion	35 36 43 169 289
Air Content	45 497
Air Content Mix Water	497
Specific Gravity	33 51

CCRL PROFICIENCY SAMPLE PROGRAM  
 Blended Cement Proficiency Samples No. 51 and No. 52  
 Final Report - May 9, 2003  
 Physical Results

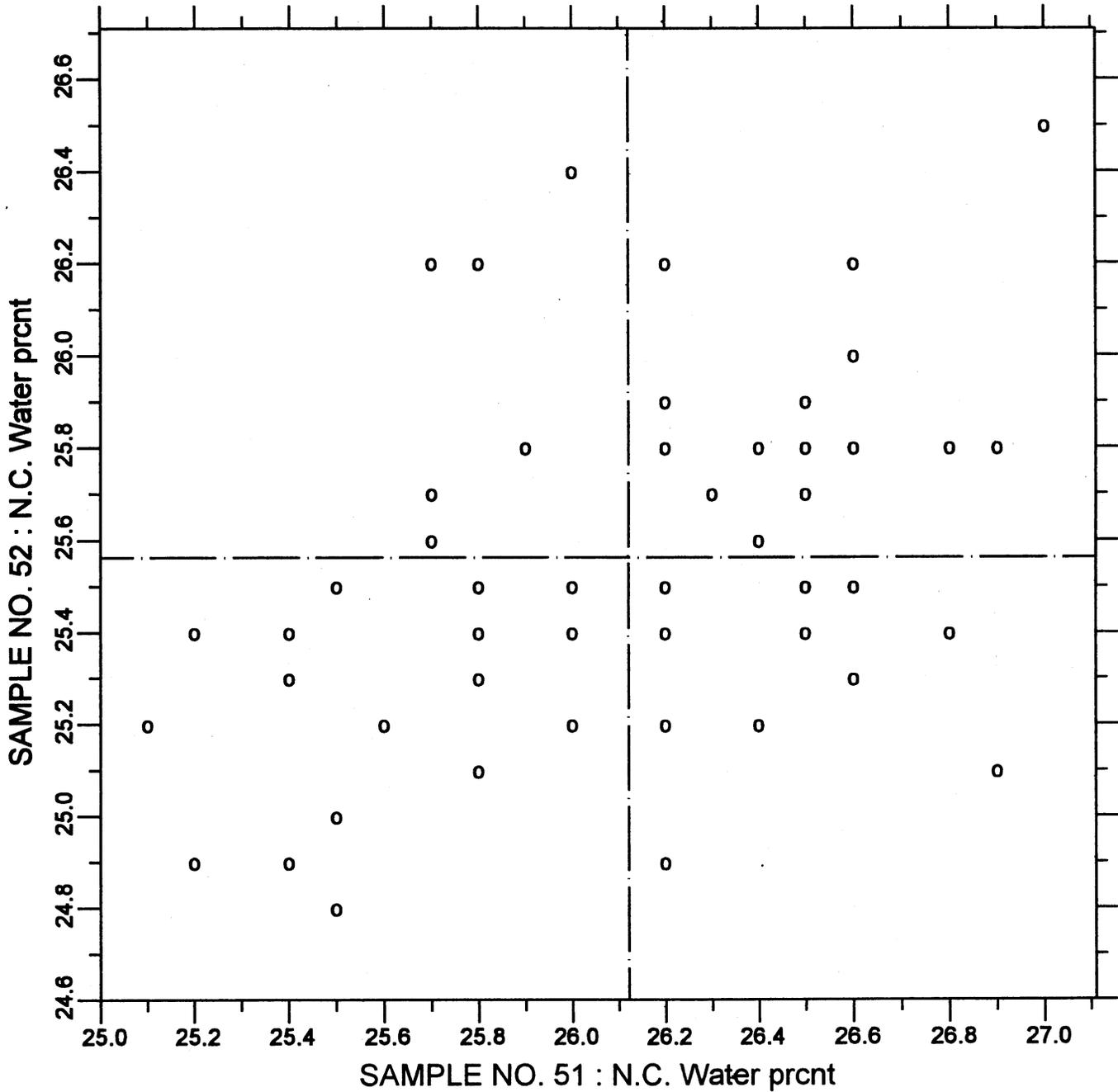
SUMMARY OF RESULTS

Test		#Labs	Sample No. 51			Sample No. 52		
			Average	S.D.	C.V.	Average	S.D.	C.V.
Comp Str 3-day	psi	63	4087	333.7	8.17	3588	393.9	10.98
Comp Str 3-day	psi	* 62	4103	309.8	7.55	3609	361.8	10.03
Comp Str 7-day	psi	63	5004	413.8	8.27	5052	421.8	8.35
Comp Str 7-day	psi	* 60	5061	323.9	6.40	5111	334.4	6.54
Comp Str 28-day	psi	55	6673	529.8	7.94	6654	596.5	8.96
Comp Str 28-day	psi	* 53	6736	414.2	6.15	6725	477.7	7.10
CS Mix Water	prcnt	62	48.0	1.6	3.42	47.8	1.6	3.36
Comp Str Flow	prcnt	61	111	3.6	3.22	111	3.7	3.30
Comp Str Flow	prcnt	* 55	110	2.6	2.36	110	2.5	2.30
Fineness AP	cm <sup>2</sup> /g	61	5163	617.2	11.96	4039	323.4	8.01
Fineness AP	cm <sup>2</sup> /g	* 60	5129	562.7	10.97	4021	294.9	7.33
45 $\mu$ m Sieve	prcnt	58	98.32	0.49	0.496	96.74	1.16	1.200
45 $\mu$ m Sieve	prcnt	* 55	98.395	0.37	0.381	96.930	0.66	0.682

\* ELIMINATED LABS: Data over three S.D. from the mean

Comp Strength 3-day 9  
 Comp Strength 7-day 9 25 1799  
 Comp Strength 28-day 9 1799  
 Comp Strength Flow 11 159 22 289 51 50  
 Fineness Air Permeability 70  
 45 $\mu$ m Sieve 22 34 51

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Normal Consistency - % Water**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.110**

**N.C. Water**

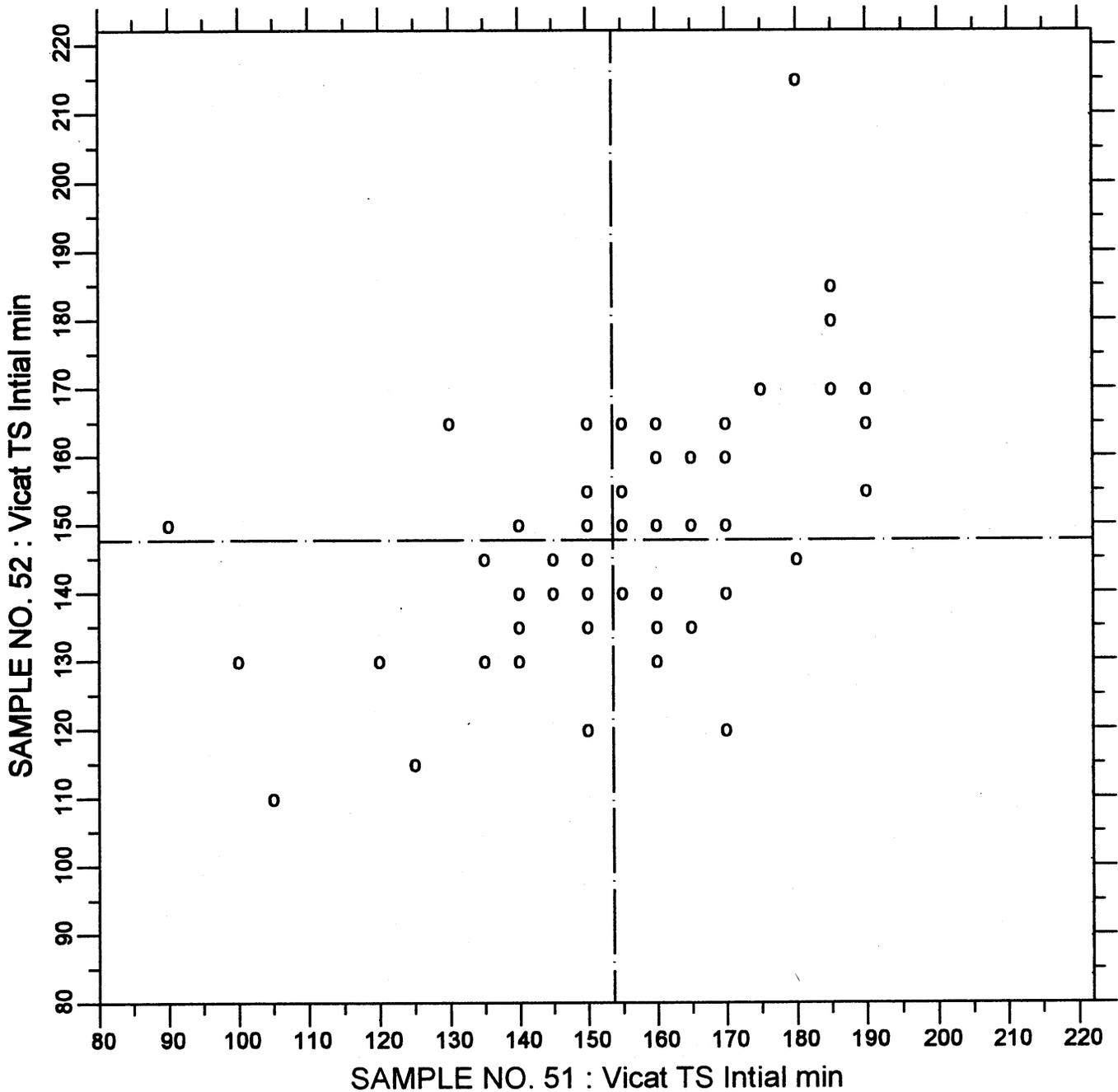
**61 POINTS**

SAMPLE NO. 51 AVE 26.121 S.D. 0.48 C.V. 1.82

SAMPLE NO. 52 AVE 25.562 S.D. 0.38 C.V. 1.50

LABS ELIMINATED 34 975

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Vicat Time of Set - Initial**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.120**

**Vicat TS Intial**

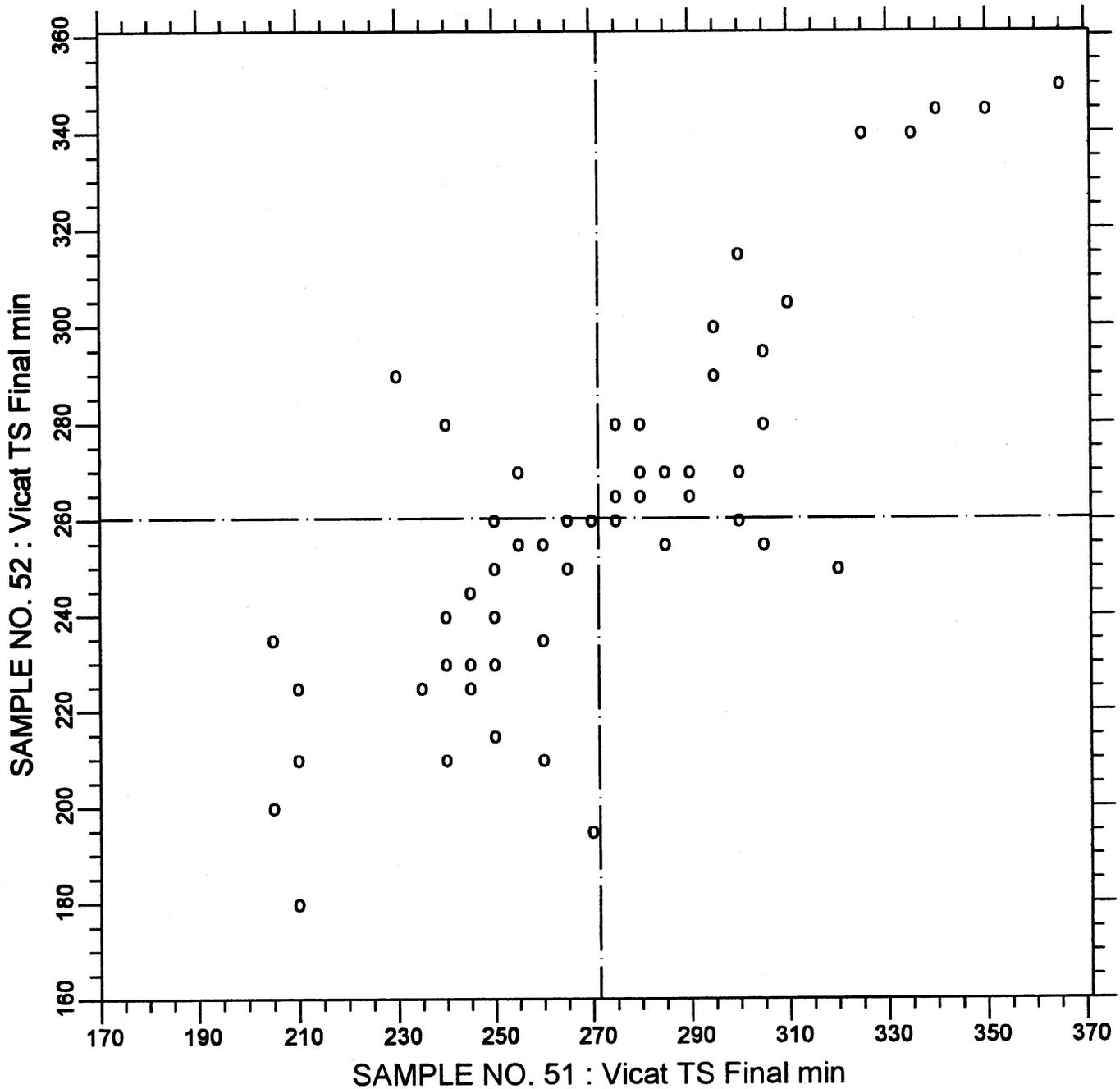
**59 POINTS**

**SAMPLE NO. 51 AVE 153.6 S.D. 21.8 C.V. 14.2**

**SAMPLE NO. 52 AVE 147.6 S.D. 18.5 C.V. 12.5**

**LABS ELIMINATED 33 975**

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Vicat Time of Set - Final**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.121**

**Vicat TS Final**

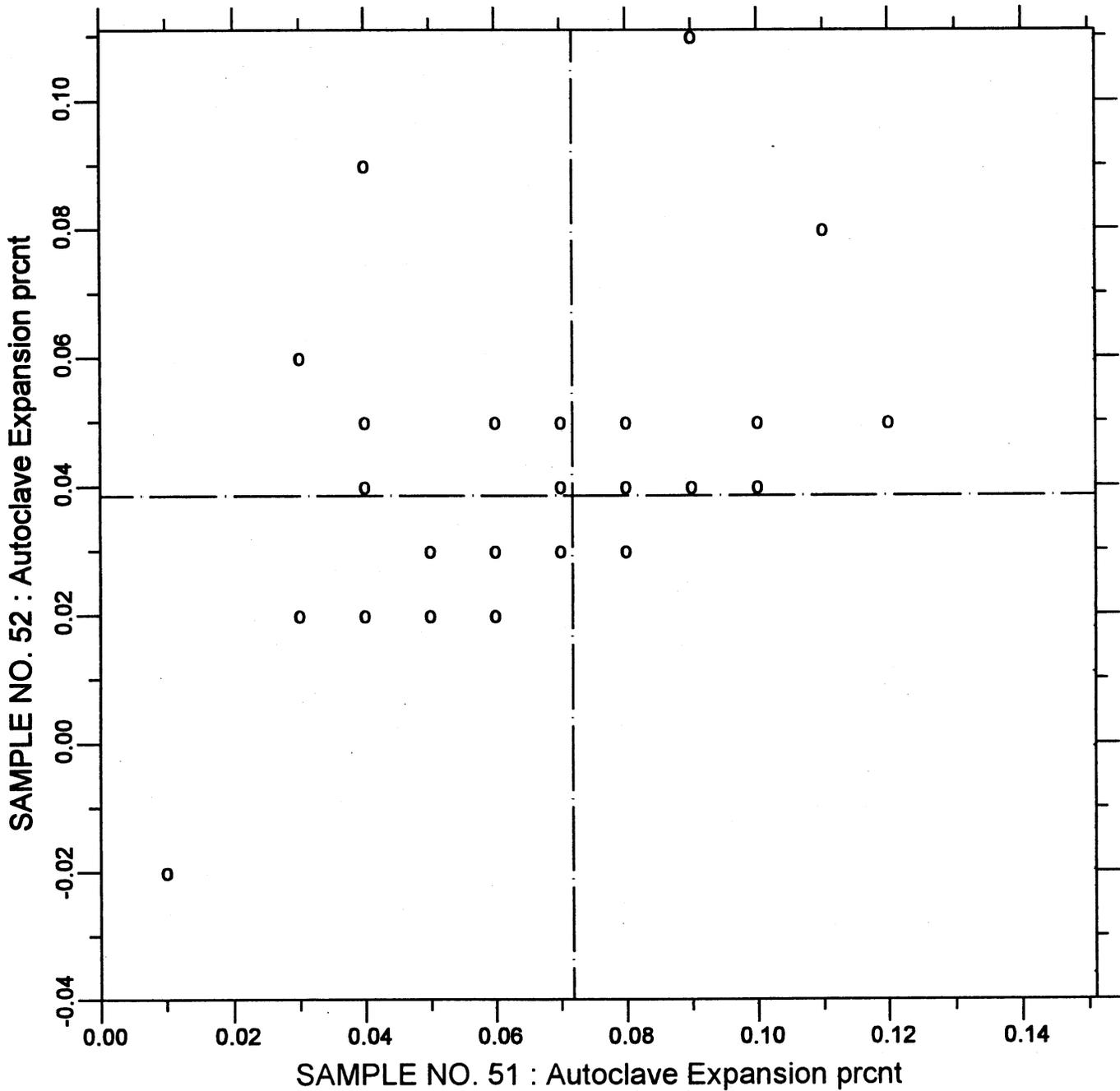
**58 POINTS**

**SAMPLE NO. 51 AVE 271.5 S.D. 35.7 C.V. 13.1**

**SAMPLE NO. 52 AVE 260.2 S.D. 38.1 C.V. 14.6**

**LABS ELIMINATED 51**

CCRL PROFICIENCY SAMPLE PROGRAM  
Autoclave Expansion  
BLENDED CEMENT SAMPLE NOS. 51 & 52



TEST NO.160

Autoclave Expansion

54 POINTS

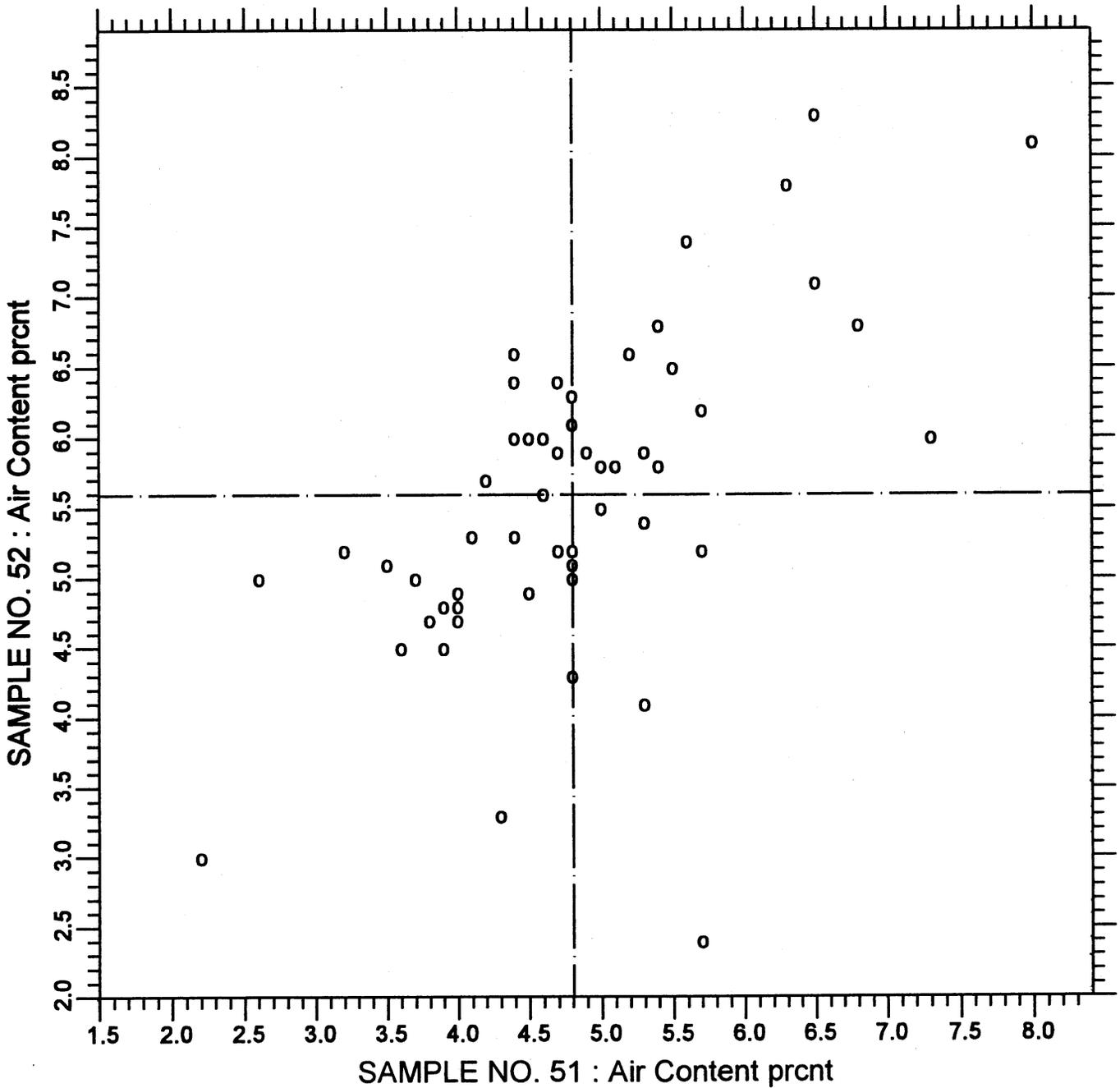
SAMPLE NO. 51 AVE 0.0718 S.D. 0.025 C.V. 34.5

SAMPLE NO. 52 AVE 0.0385 S.D. 0.018 C.V. 47.5

LABS ELIMINATED 35 36 43 169 289

LABS OFF DIAGRAM 1251

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Air Content**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.170**

**Air Content**

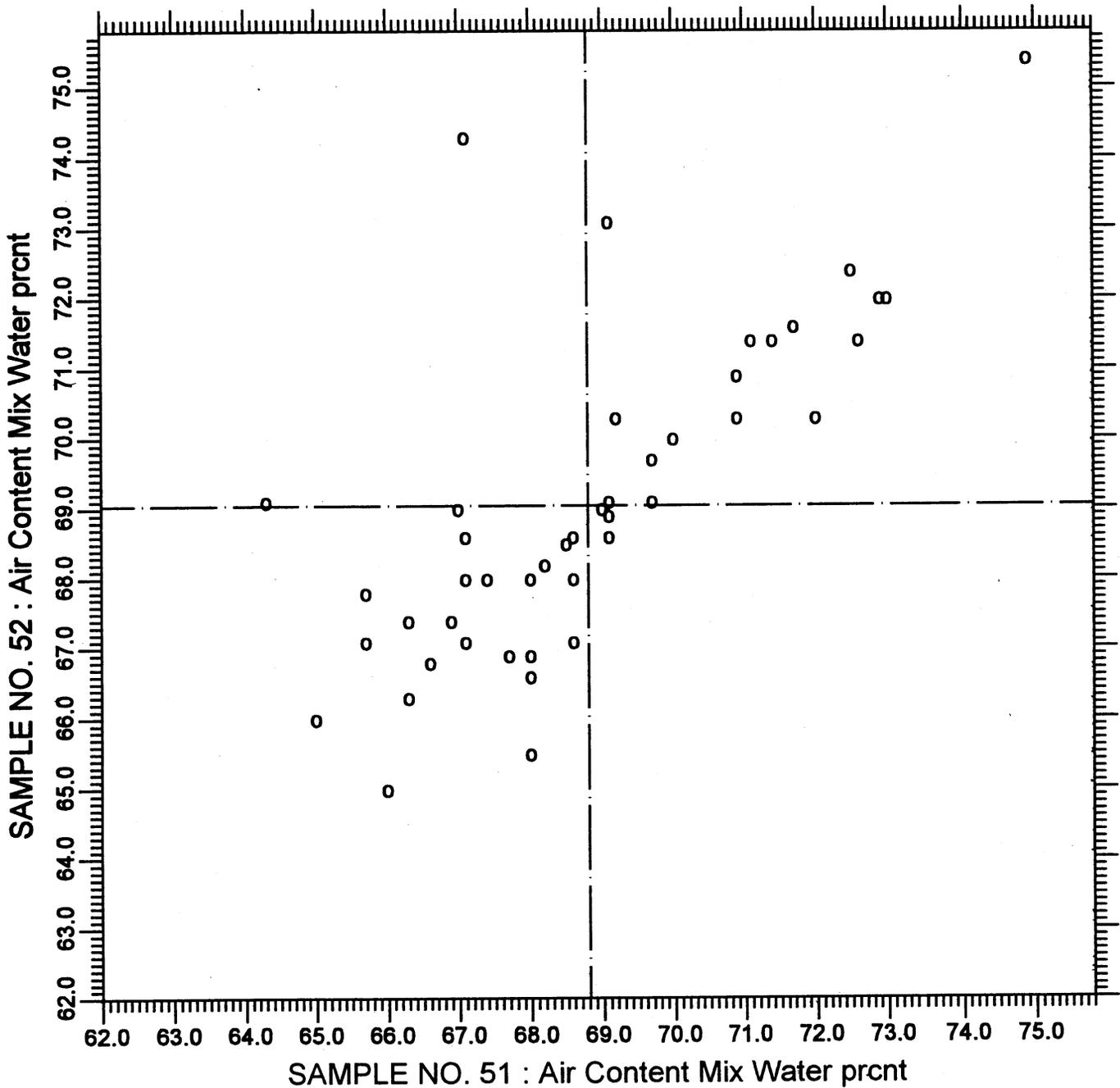
**54 POINTS**

SAMPLE NO. 51 AVE 4.80 S.D. 1.0 C.V. 22.0

SAMPLE NO. 52 AVE 5.59 S.D. 1.1 C.V. 20.2

LABS ELIMINATED 45 497

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Air Content - % Water**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.180**

**Air Content Mix Water**

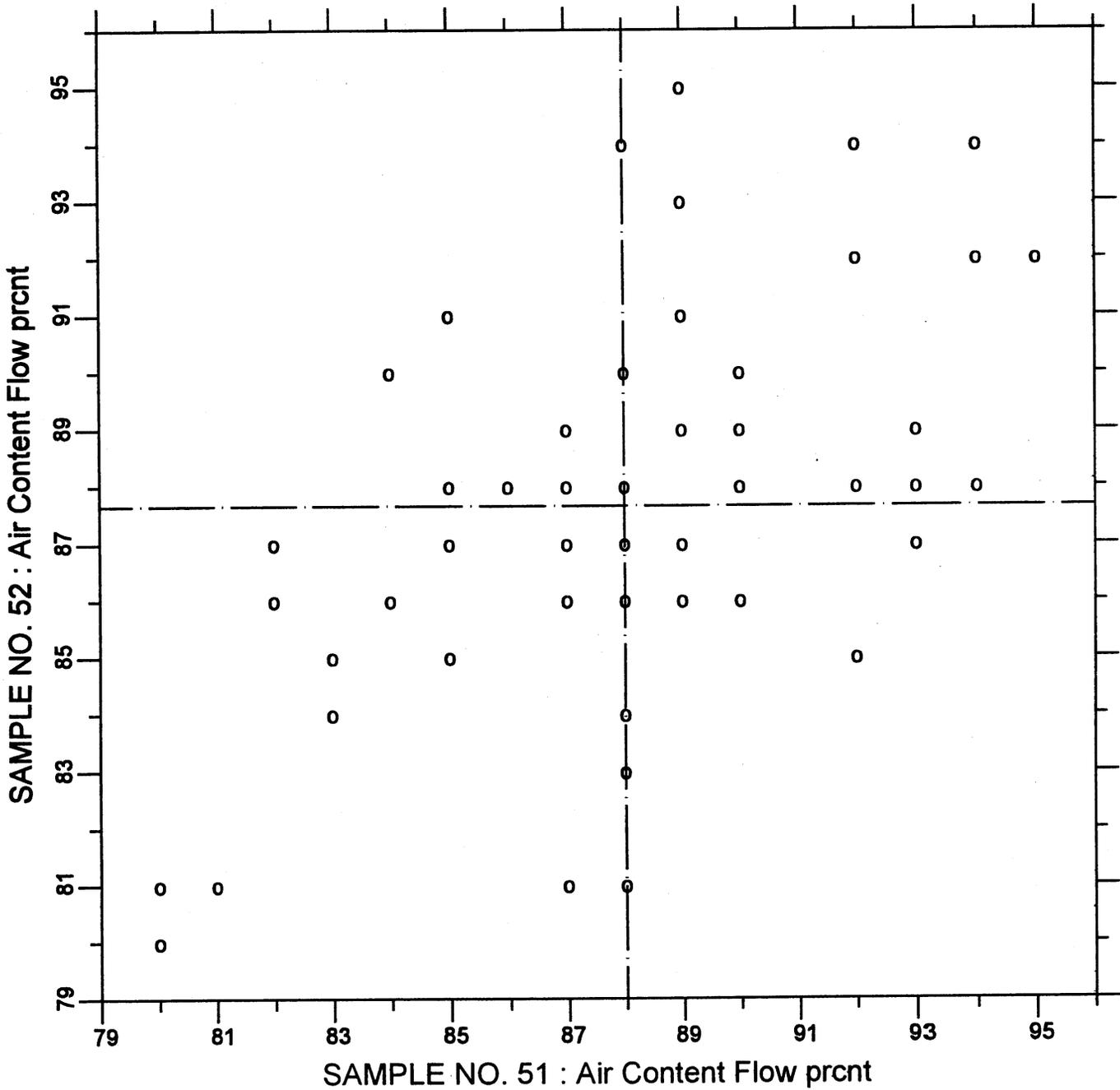
**55 POINTS**

SAMPLE NO. 51    AVE 68.81    S.D. 2.2    C.V. 3.16

SAMPLE NO. 52    AVE 69.04    S.D. 2.1    C.V. 3.08

LABS ELIMINATED 497

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Air Content - Flow**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



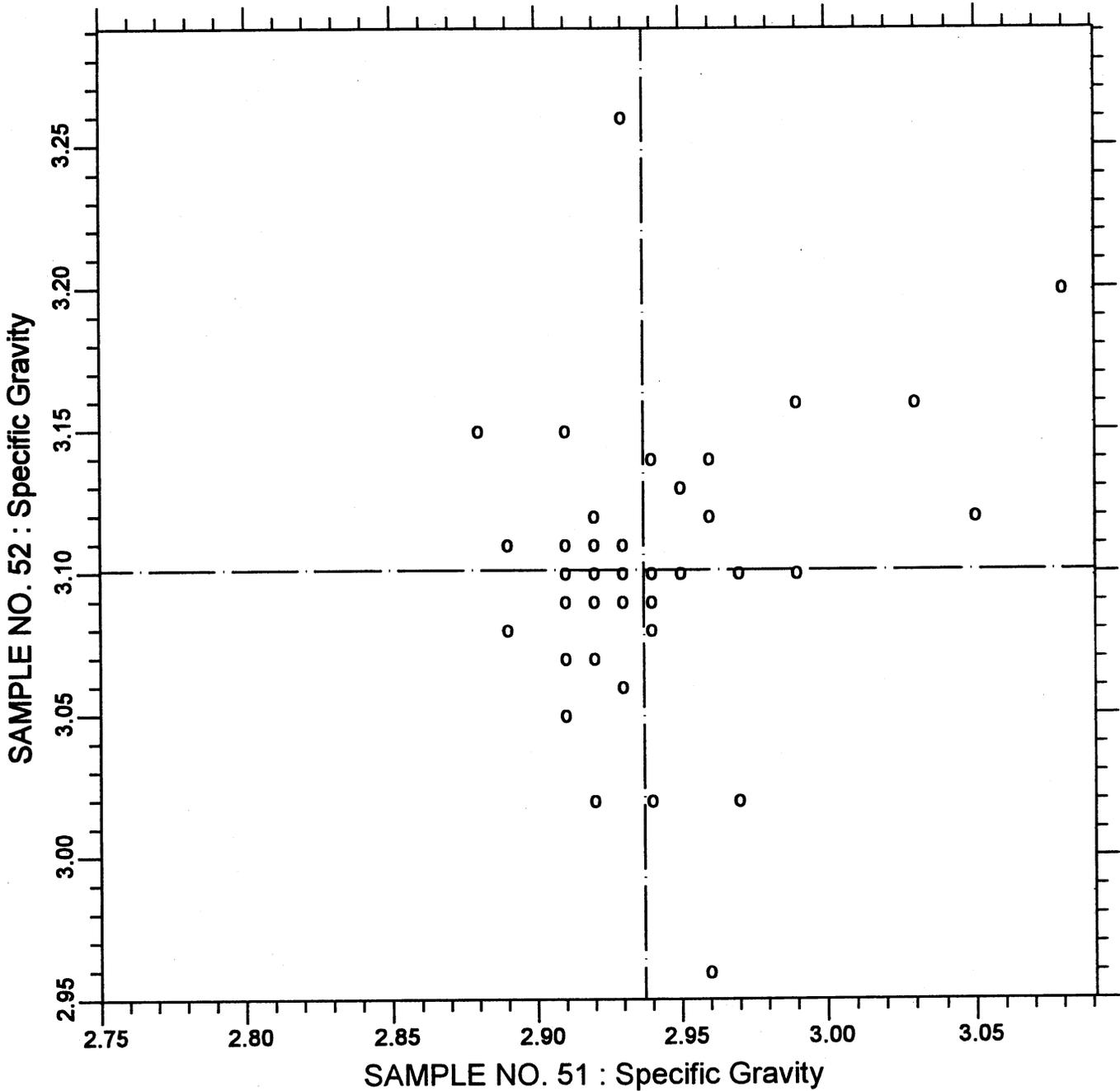
**TEST NO.190**

**Air Content Flow**

**56 POINTS**

SAMPLE NO. 51	AVE	88.00	S.D.	3.6	C.V.	4.07
SAMPLE NO. 52	AVE	87.66	S.D.	3.4	C.V.	3.88

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Specific Gravity**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.310**

**Specific Gravity**

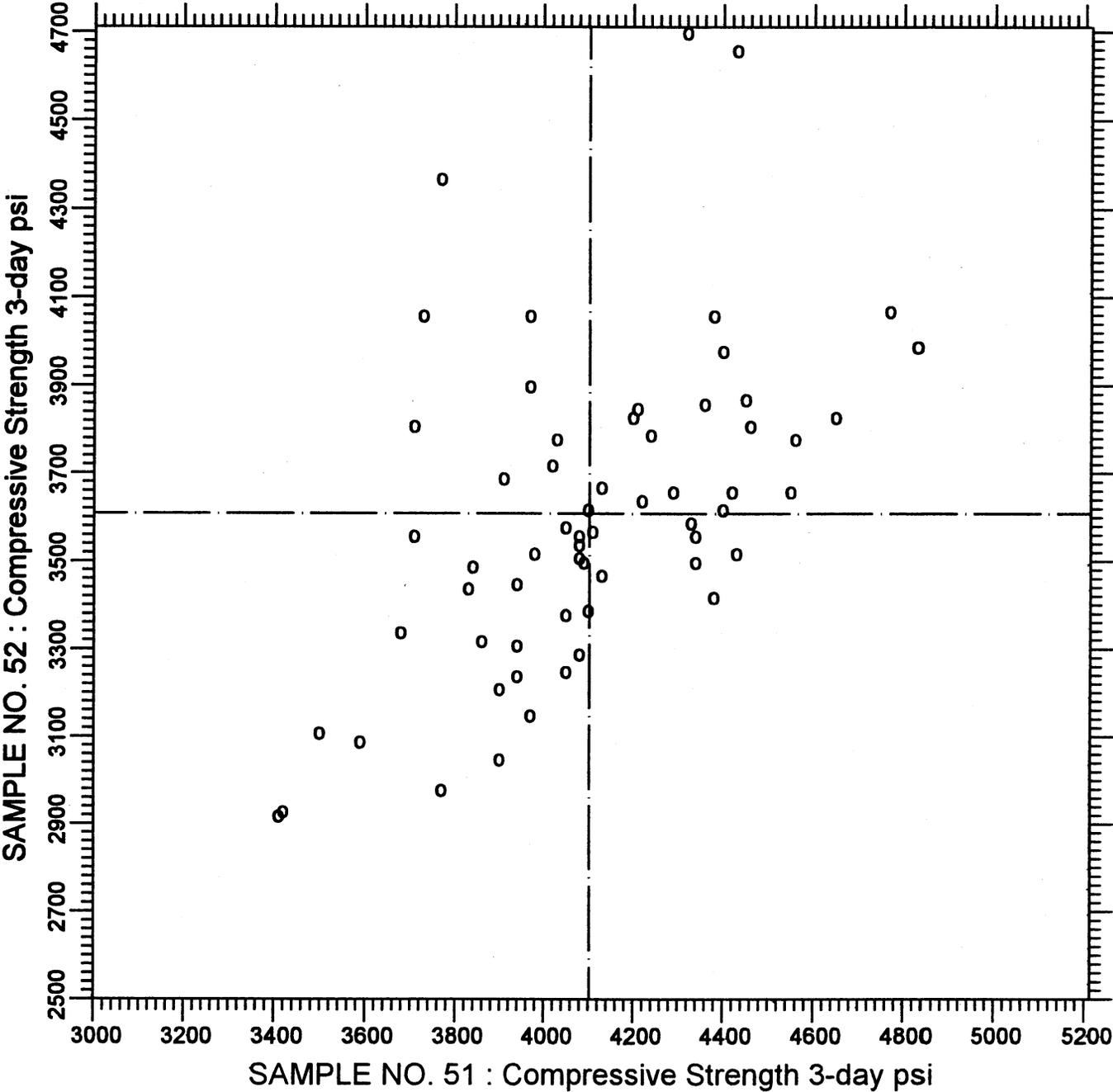
**49 POINTS**

SAMPLE NO. 51 AVE 2.9373 S.D. 0.038 C.V. 1.30

SAMPLE NO. 52 AVE 3.1008 S.D. 0.048 C.V. 1.54

LABS ELIMINATED 33 51

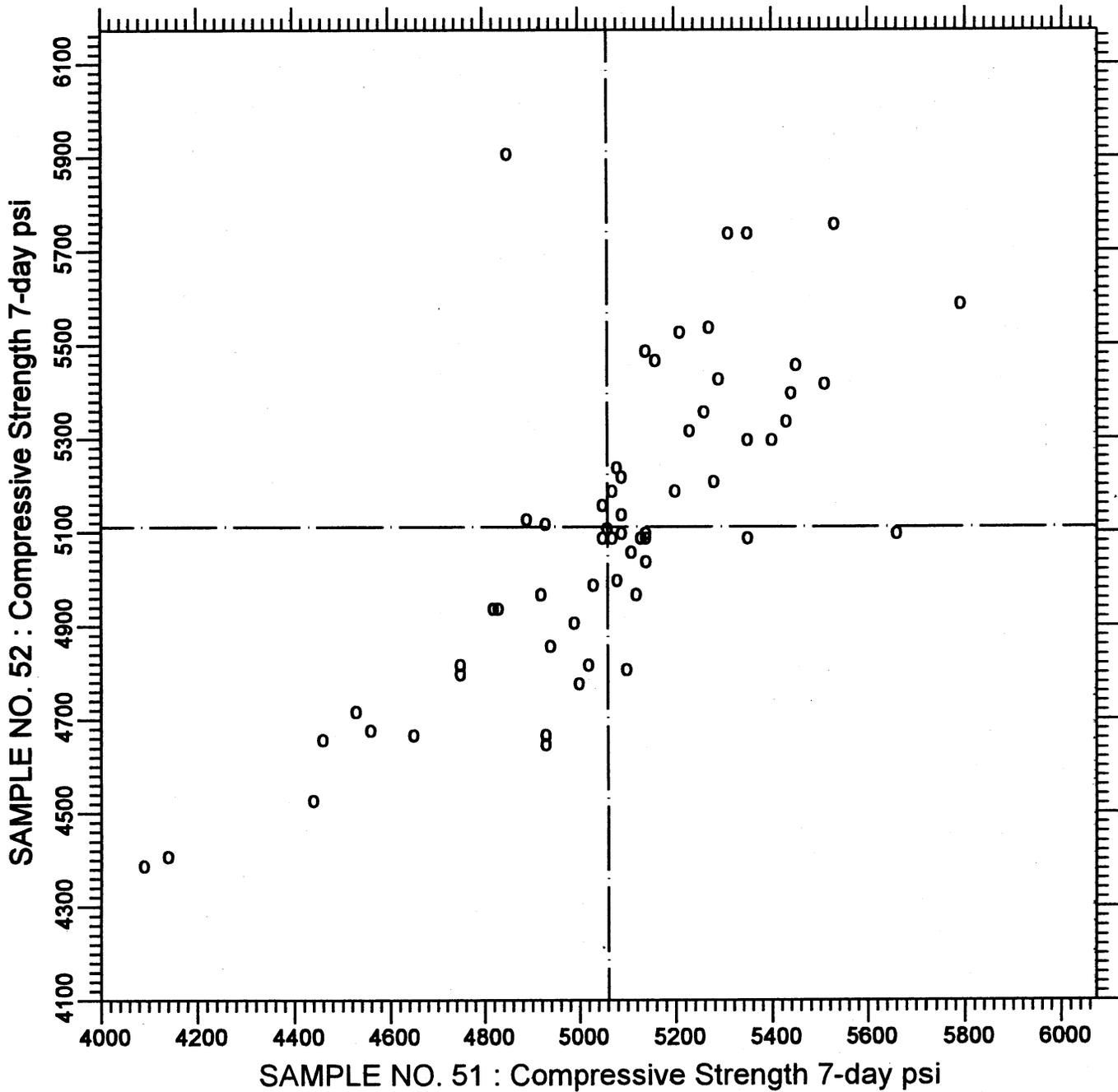
**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Compressive Strength - 3-day**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.200      Compressive Strength 3-day      62 POINTS**

SAMPLE NO. 51    AVE 4102.9    S.D. 309.8    C.V. 7.55  
 SAMPLE NO. 52    AVE 3608.7    S.D. 361.8    C.V. 10.03  
 LABS ELIMINATED 9

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Compressive Strength - 7-day**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



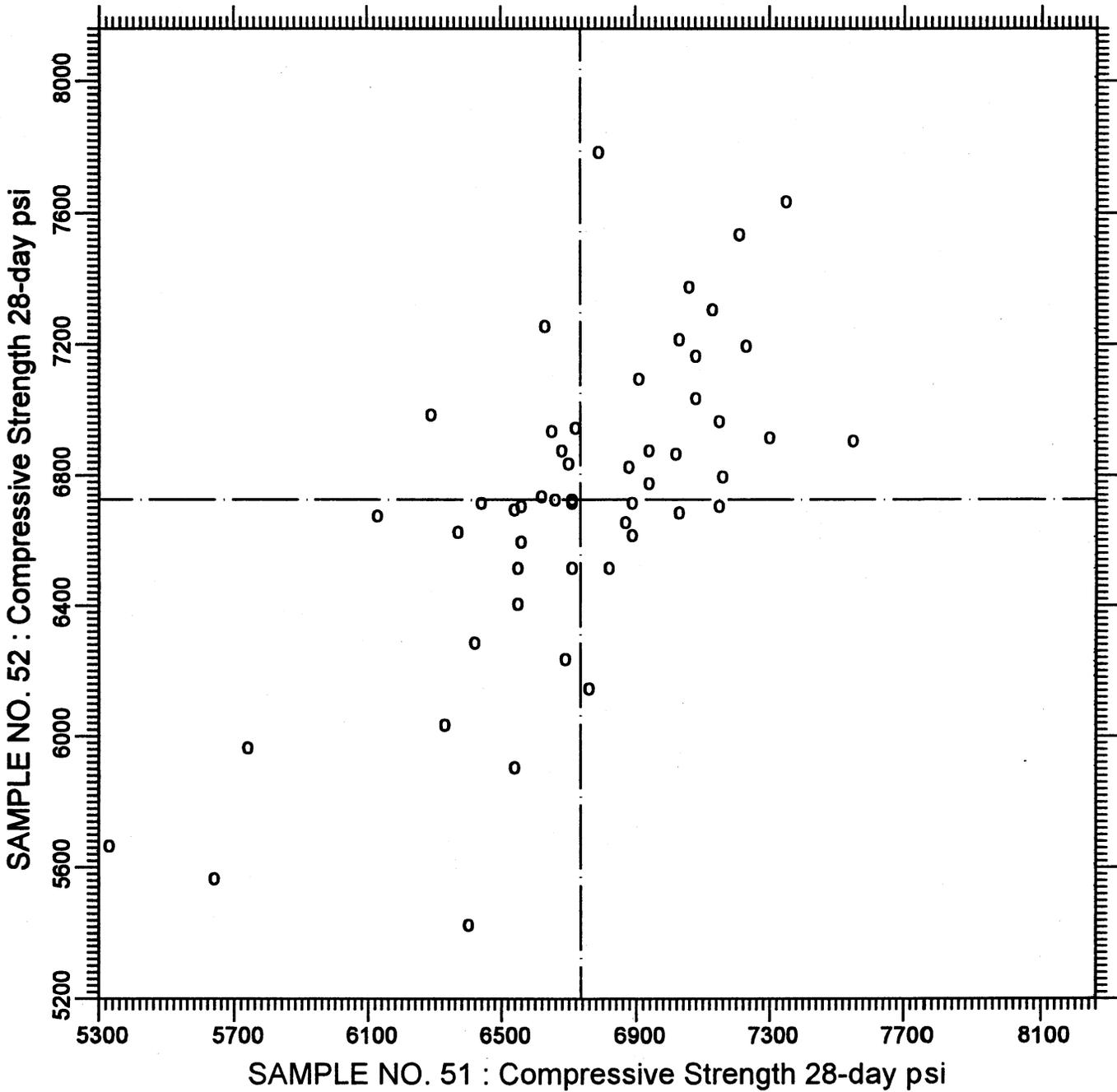
**TEST NO.210      Compressive Strength 7-day      60 POINTS**

**SAMPLE NO. 51    AVE 5061.2    S.D. 323.9    C.V. 6.40**

**SAMPLE NO. 52    AVE 5110.8    S.D. 334.4    C.V. 6.54**

**LABS ELIMINATED 9 25 1799**

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Compressive Strength - 28-day**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



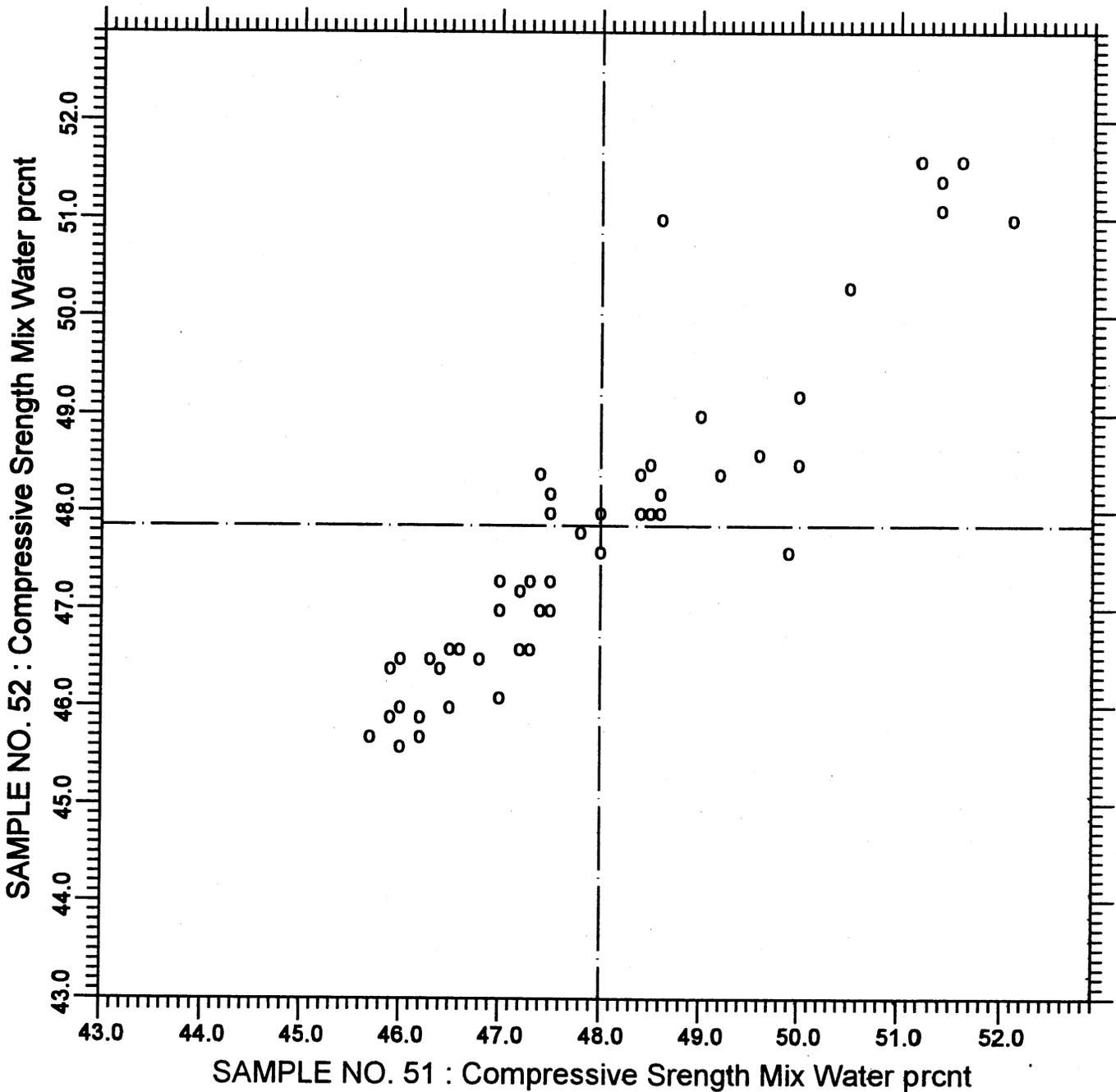
**TEST NO.211    Compressive Strength 28-day    53 POINTS**

SAMPLE NO. 51    AVE 6735.5    S.D. 414.2    C.V. 6.15

SAMPLE NO. 52    AVE 6725.1    S.D. 477.7    C.V. 7.10

LABS ELIMINATED 9 1799

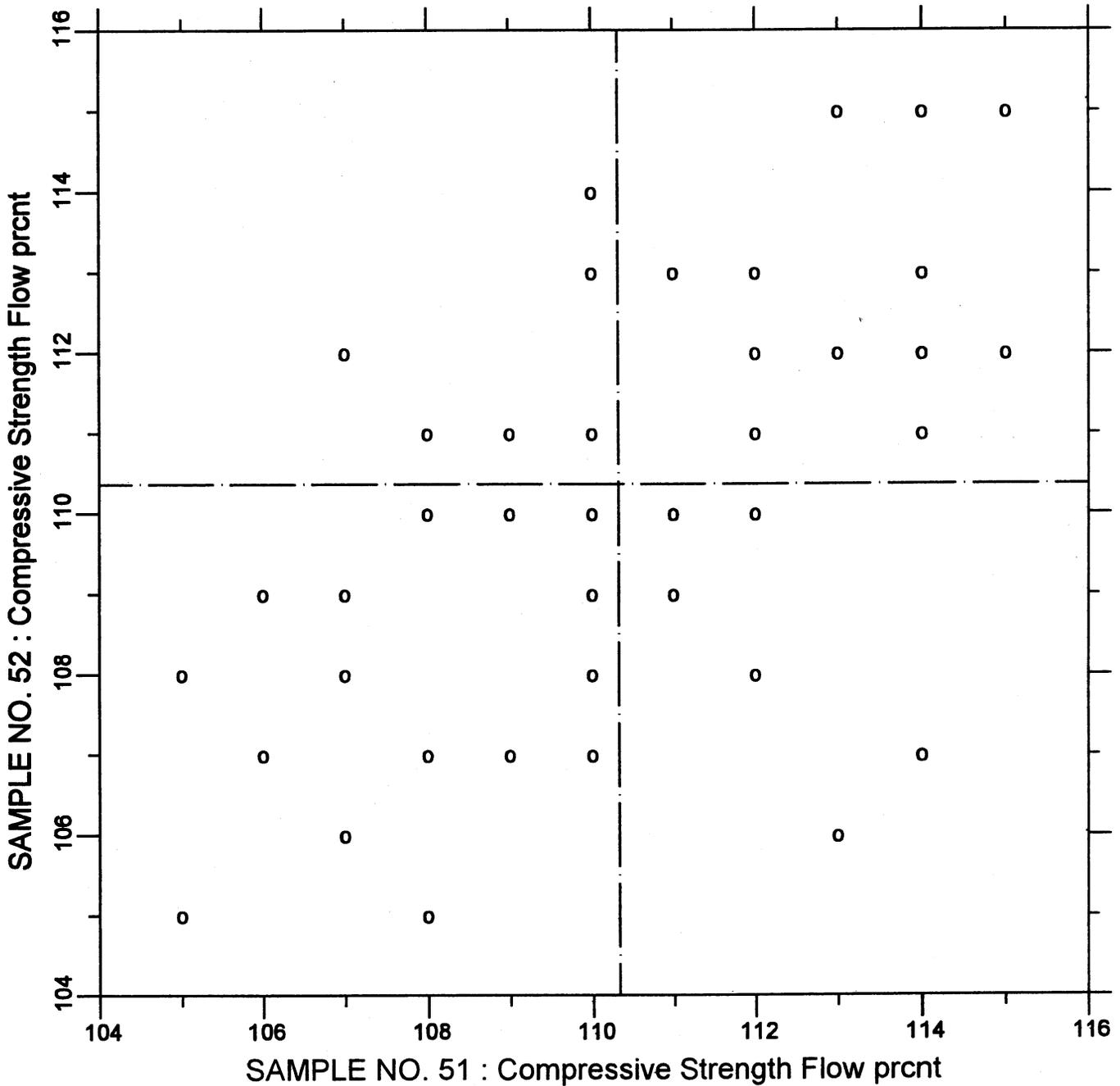
**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Compressive Strength - % Water**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.220 Compressive Srength Mix Water 62 POINTS**

SAMPLE NO. 51	AVE	48.00	S.D.	1.6	C.V.	3.42
SAMPLE NO. 52	AVE	47.85	S.D.	1.6	C.V.	3.36

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Compressive Strength - Flow**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



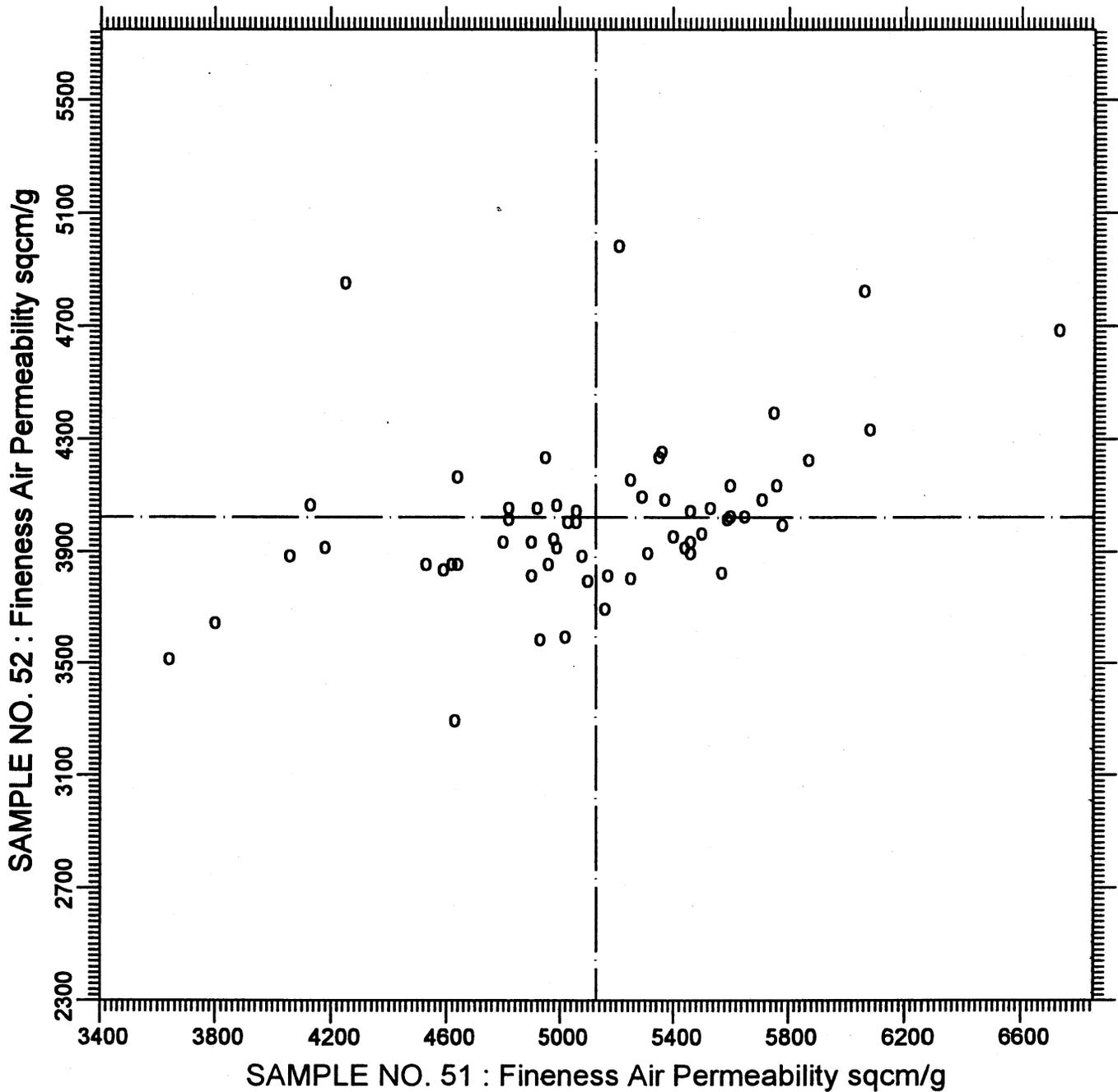
**TEST NO.230      Compressive Strength Flow      55 POINTS**

SAMPLE NO. 51    AVE 110.33    S.D. 2.6    C.V. 2.36

SAMPLE NO. 52    AVE 110.36    S.D. 2.5    C.V. 2.30

LABS ELIMINATED 11 159 22 289 51 50

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Fineness - Air Permeability**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



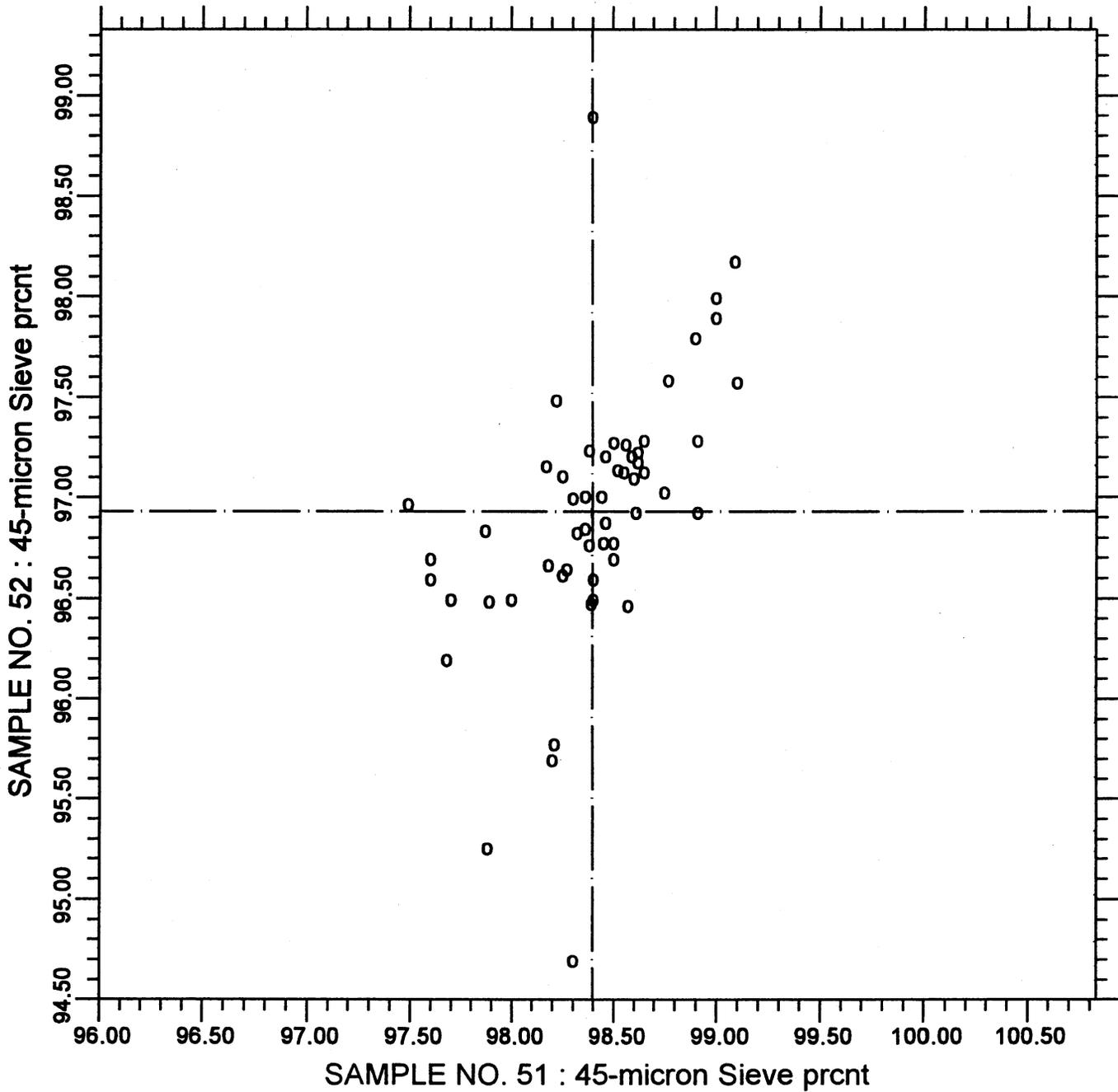
**TEST NO.270      Fineness Air Permeability      60 POINTS**

SAMPLE NO. 51    AVE 5129.0    S.D. 562.7    C.V. 10.97

SAMPLE NO. 52    AVE 4021.2    S.D. 294.9    C.V. 7.33

LABS ELIMINATED 70

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**45-micron Sieve - % Passing**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.281**

**45-micron Sieve**

**55 POINTS**

SAMPLE NO. 51 AVE 98.395 S.D. 0.37 C.V. 0.381

SAMPLE NO. 52 AVE 96.930 S.D. 0.66 C.V. 0.682

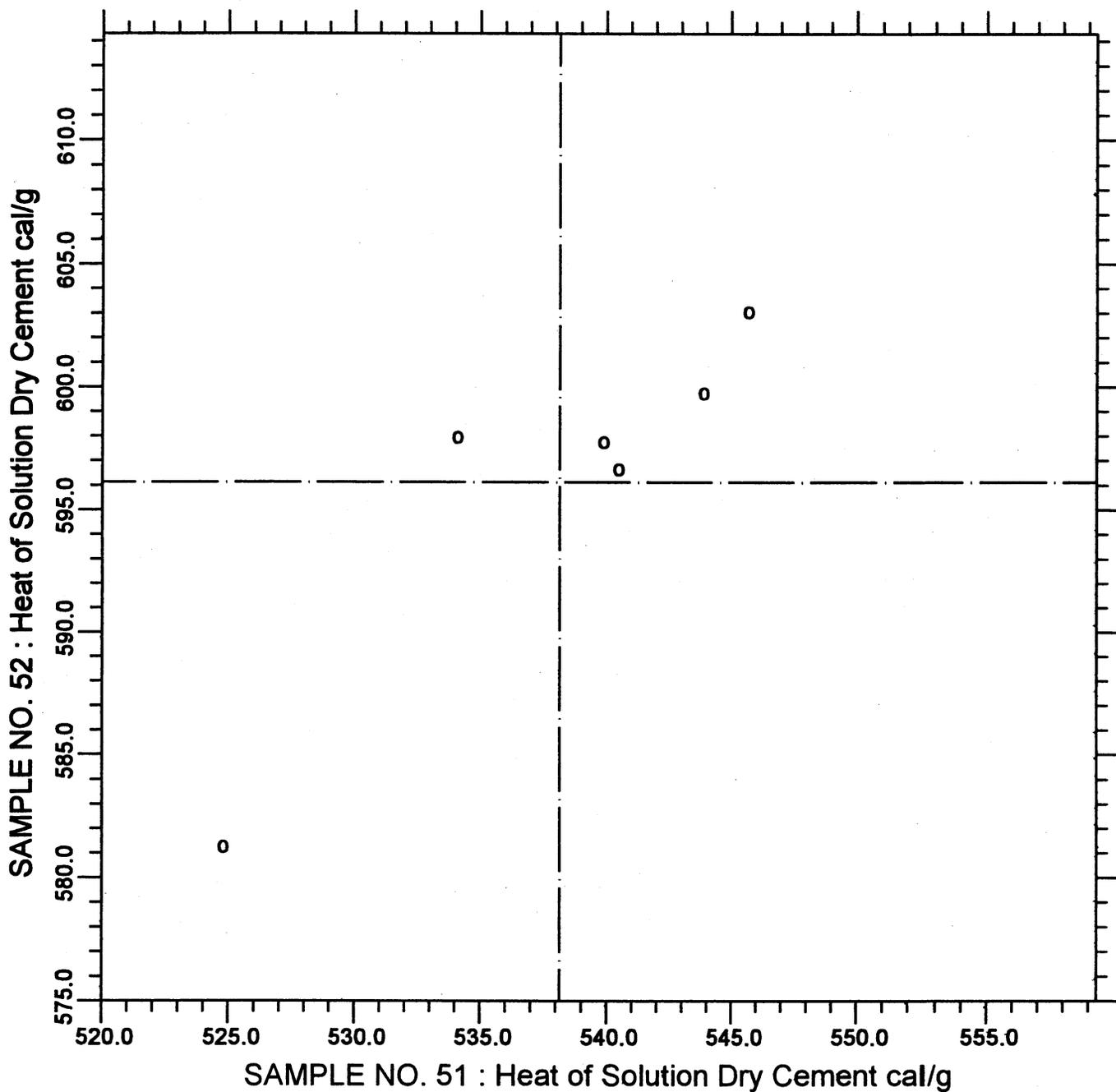
LABS ELIMINATED 22 34 51

CCRL PROFICIENCY SAMPLE PROGRAM  
 Blended Cement Proficiency Samples No. 51 and No. 52  
 Final Report - May 9, 2003  
 Heat of Hydration Results

SUMMARY OF RESULTS

		Sample No. 51				Sample No. 52		
Test		#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Heat Solution Dry	cal/g	6	538.2	7.6	1.42	596.1	7.6	1.27
Heat Sol 7-day	cal/g	6	460.4	8.8	1.91	513.8	11.0	2.14
Heat Sol 28-day	cal/g	3	458.7	10.6	2.31	509.2	9.9	1.94
Heat Hyd 7-day	cal/g	6	77.8	8.1	10.45	82.4	5.4	6.61
Heat Hyd 28-day	cal/g	3	85.7	9.2	10.80	91.4	7.9	8.65

CCRL PROFICIENCY SAMPLE PROGRAM  
Heat of Solution - Dry Cement  
BLENDED CEMENT SAMPLE NOS. 51 & 52

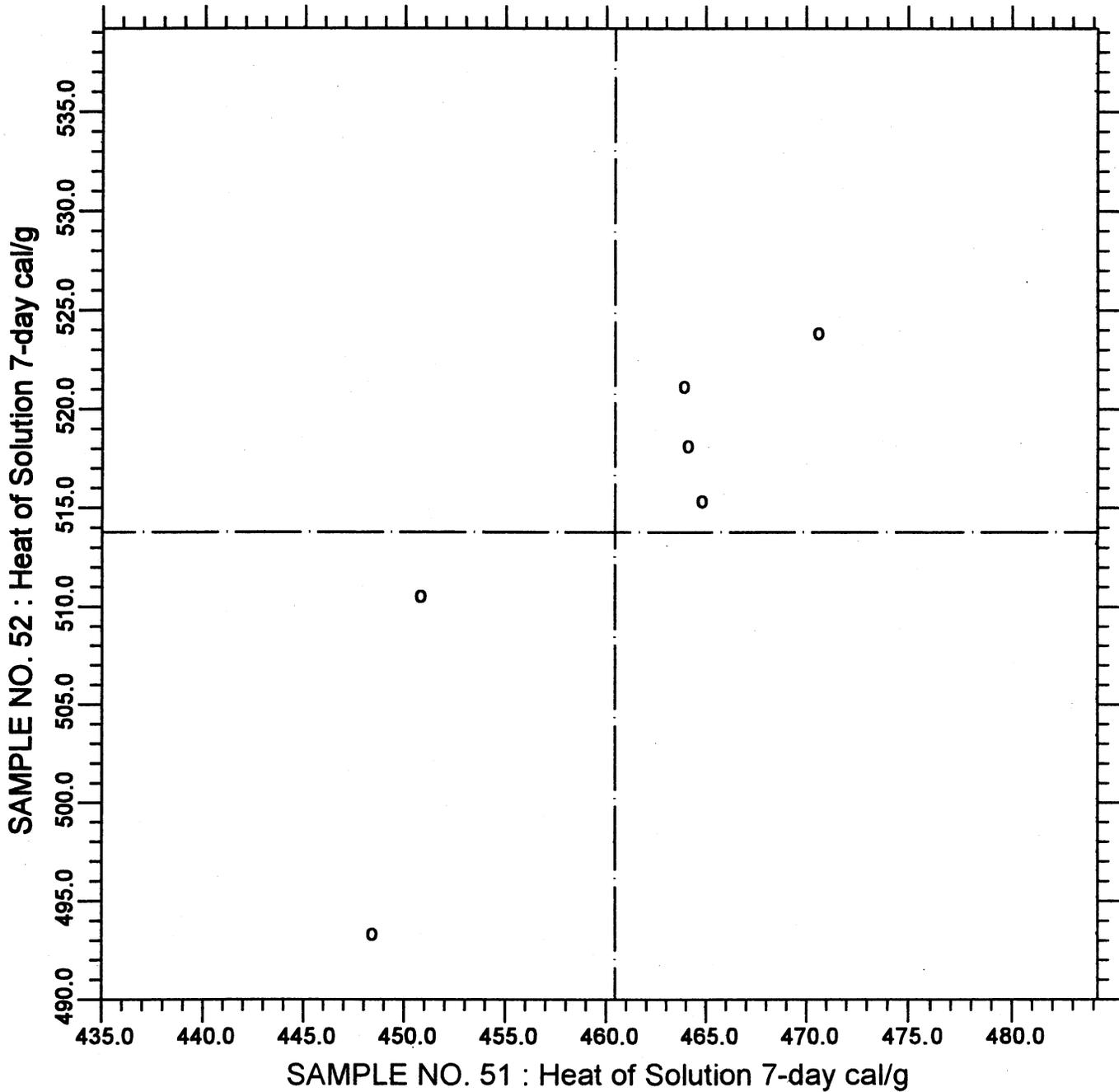


TEST NO.291      Heat of Solution Dry Cement      6 POINTS

SAMPLE NO. 51    AVE 538.2    S.D. 7.6    C.V. 1.42

SAMPLE NO. 52    AVE 596.1    S.D. 7.6    C.V. 1.27

CCRL PROFICIENCY SAMPLE PROGRAM  
Heat of Solution - 7-day  
BLENDED CEMENT SAMPLE NOS. 51 & 52



TEST NO.292

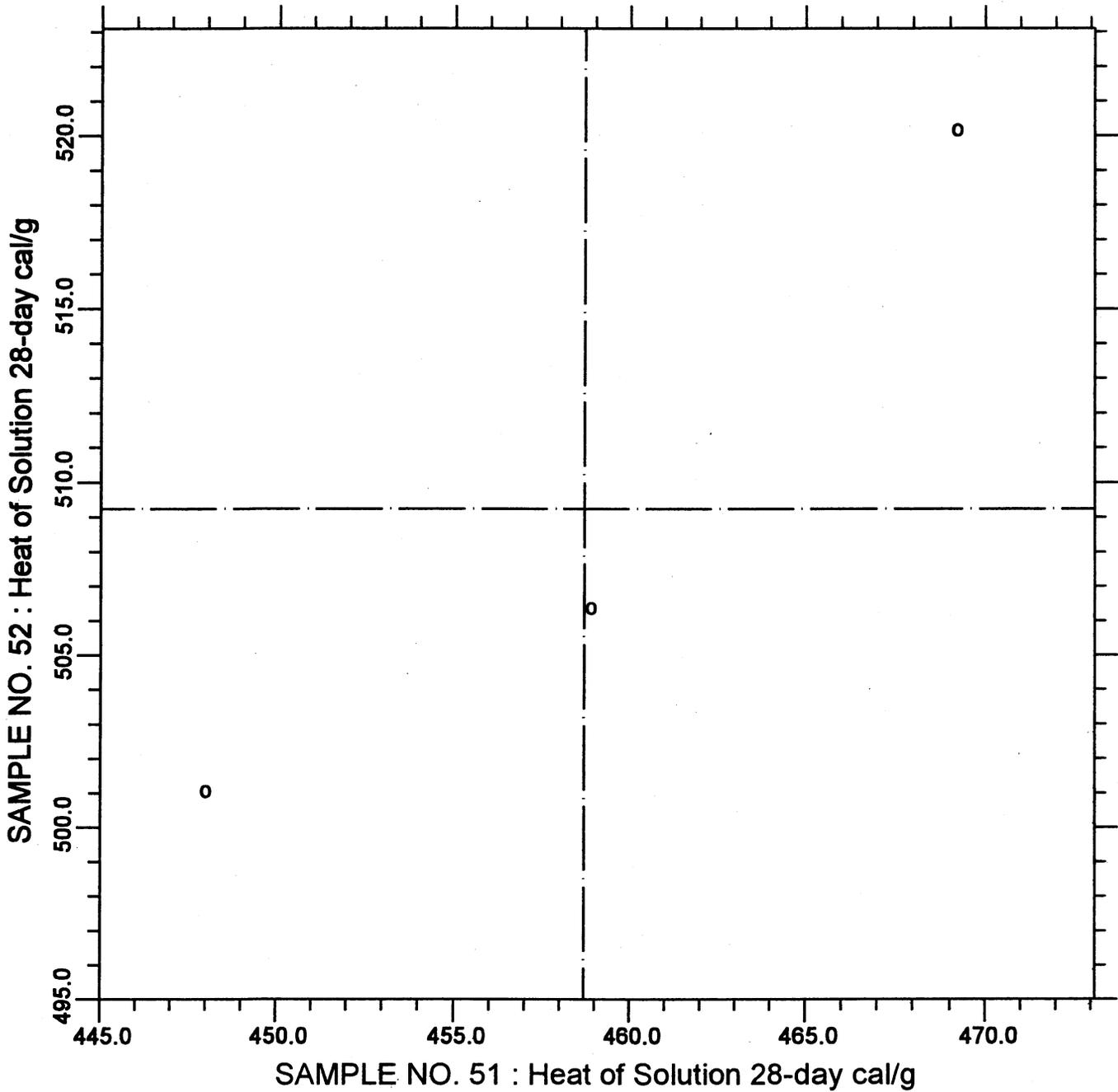
Heat of Solution 7-day

6 POINTS

SAMPLE NO. 51 AVE 460.4 S.D. 8.8 C.V. 1.91

SAMPLE NO. 52 AVE 513.8 S.D. 11.0 C.V. 2.14

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Heat of Solution - 28-day**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.301**

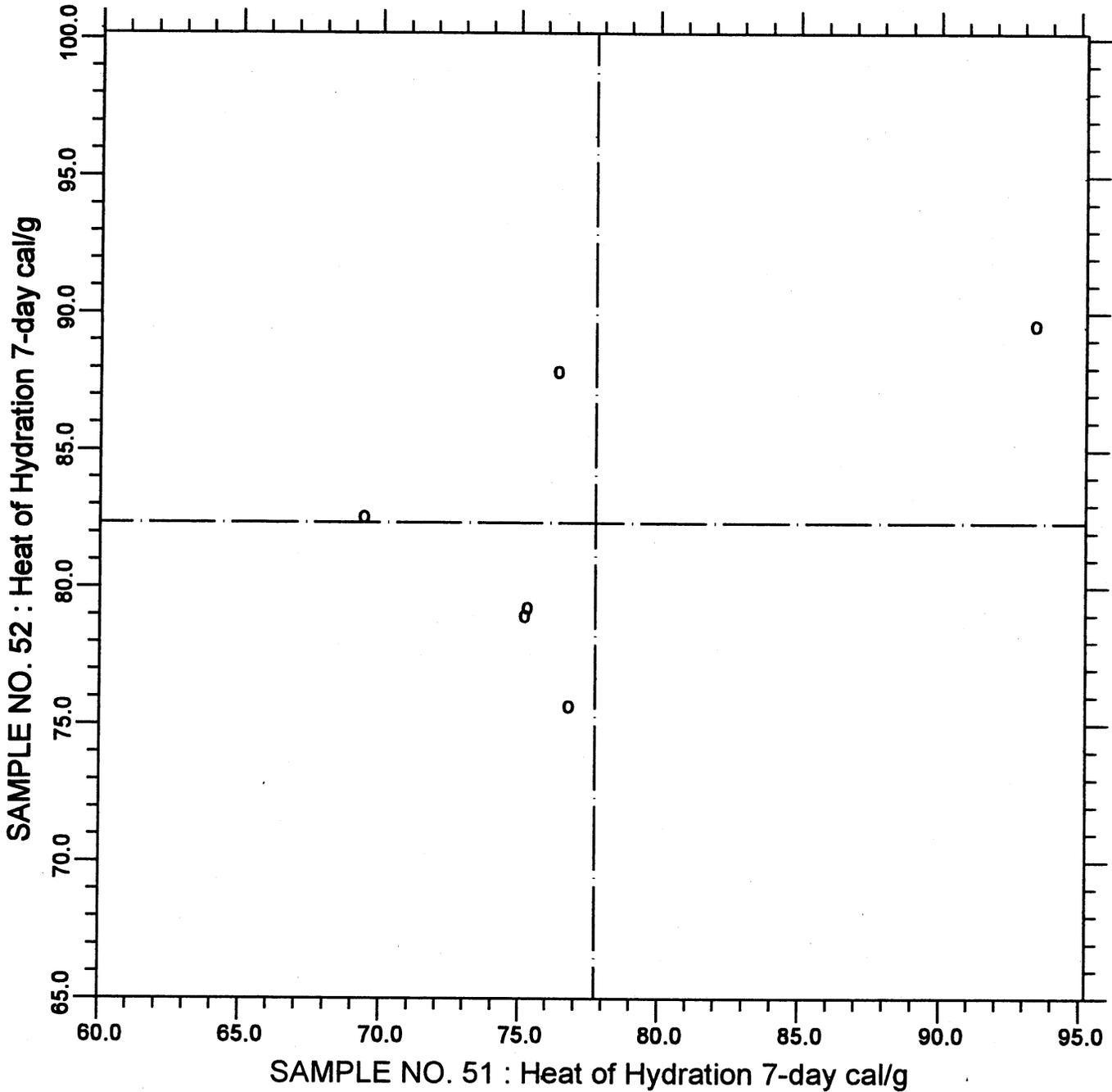
**Heat of Solution 28-day**

**3 POINTS**

SAMPLE NO. 51 AVE 458.7 S.D. 10.6 C.V. 2.31

SAMPLE NO. 52 AVE 509.2 S.D. 9.9 C.V. 1.94

**CCRL PROFICIENCY SAMPLE PROGRAM**  
**Heat of Hydration - 7-day**  
**BLENDED CEMENT SAMPLE NOS. 51 & 52**



**TEST NO.290**

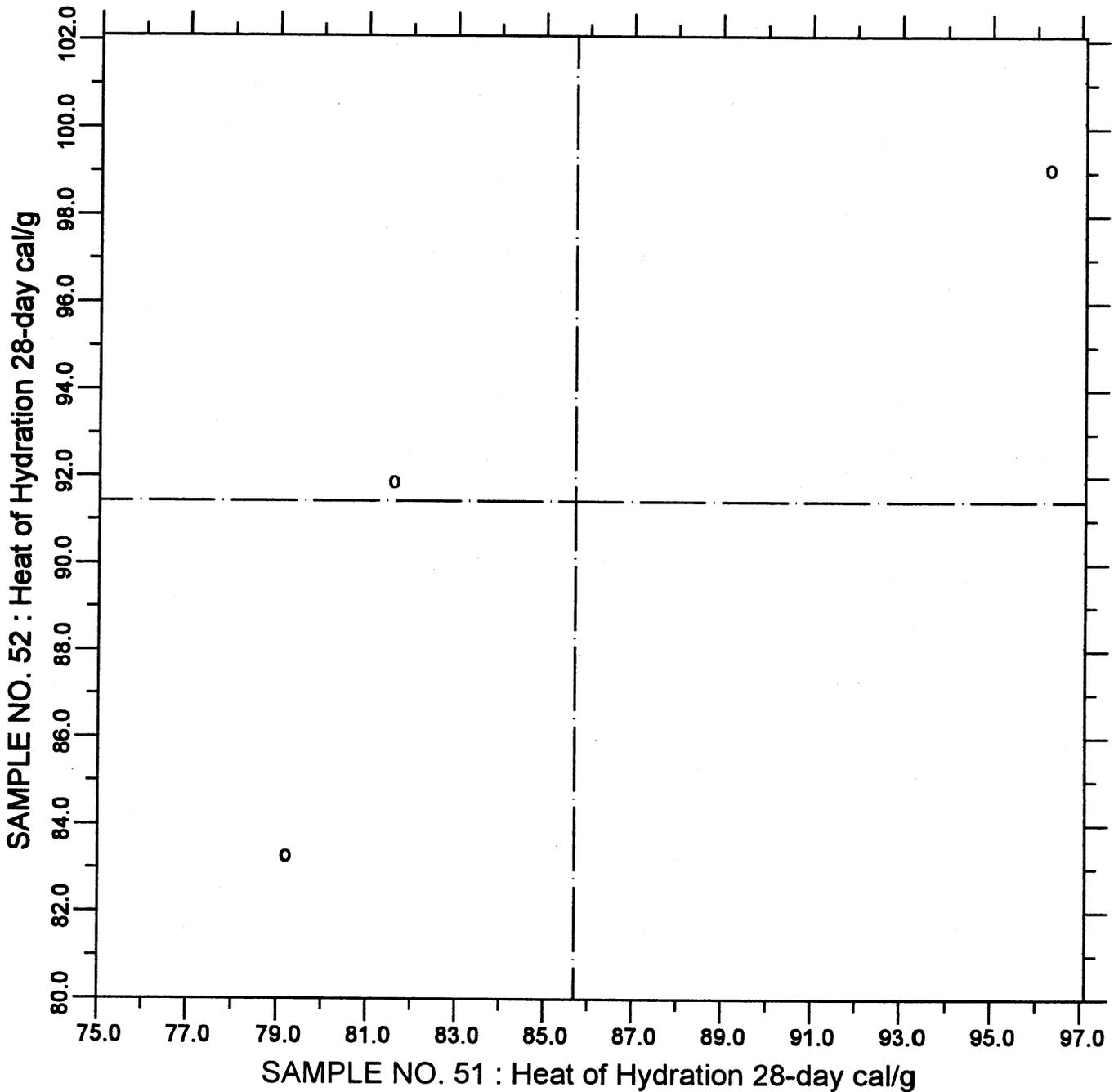
**Heat of Hydration 7-day**

**6 POINTS**

SAMPLE NO. 51    AVE 77.8    S.D. 8.1    C.V. 10.45

SAMPLE NO. 52    AVE 82.4    S.D. 5.4    C.V. 6.61

CCRL PROFICIENCY SAMPLE PROGRAM  
Heat of Hydration - 28-day  
BLENDED CEMENT SAMPLE NOS. 51 & 52



TEST NO.300

Heat of Hydration 28-day

3 POINTS

SAMPLE NO. 51 AVE 85.7 S.D. 9.2 C.V. 10.80

SAMPLE NO. 52 AVE 91.4 S.D. 7.9 C.V. 8.65